The Scale of Interest:

Or the Use of 37-12-27

DECIMAL FRACTIONS,

With a Table of LOGARITHMES, demonstrating the most easie and exact Resolving all Questions in *Anatocism*, or *Compound Interest*, and Tables of *Simple Interest* also at *6 per Cent. per Annum.*

TOGETHER

With their use in the Measuring of *Board*, *Timber*, *Stone*, and *Gauging* of *Cask*, &c. very necessary for all Carpenters, Joyners, Masons, Glasiers, and all Tradesmen whatsoever.

Composed and published for the Use of the *English* Mathematical and Grammar School at *Ross* in *Herefordshire*.

ALSO,

A Direction for Deans and Chapters in Cathedrals, and the Heads and Fellows of Colledges in both Universities in their Letting of Leases and taking of Fines.

By *JOHN NEWTON* D. D. and one of His Majesties Chaplains.

Plato foribus Academiæ inscribi curavit. Ὀυδεὶς ἀγεωμέτρητος εἰσίτω

London, Printed by *E. C.* for *Dixy Page* at the Anchor and Mariner in *East-Smithfield* near the Kings Slaughter-house, who sells all sorts of Mathematical Books, and Books of Navigation.

2330:11

ERRATA.

In the Epistle to the Reader.

PAge 17. *line* 5. *read* title, *l.* 6. *r.* such an horrid, *p.* 19. *l.* 27. *r.* for surely, *p.* 20. *l.* 13. *r.* are sent.

In the Scale of Interest.

P. 1. *l.* 20. *r.* 1661. *p.* 5. *l.* 31. *r.* 1.000159. *p.* 12. *l.* 12. *r.* whole by 240. *p.* 26. *l.* 1. *r.* 237.75. *l.* 2. *r.* 237. *p.* 33 *l.* 11, & 12 *r.* from 1229.40190. the remainer, *p.* 34. *l.* 2. *r.* decreasing. *p.* 36. *l* 6. *r.* then 688196 is, *p.* 37. *l.* 5. *r.* 20 years, *p.* 40 *l.* 20. *r* find what annuity, *p.* 48. *l* 17. *r.* as often *p.* 54. *l.* 9. *r.* 1,806189, *p.* 57. *l.* 8. *r.* seek. *p.* 58. *l.* 12. *r.* Table, *p.* 59. *l.* 21. *after* number of, *add*, multitude or many unites, *p.* 73. *l.* 13. *r.* 3.237543, *p* 76. *l* 24. *r.* as many continual, *p.* 89. *l.* 1. *r.* 4 proposition, *l.* 7. *r.* it is, *p.* 94. *l.* 27. *dele* being, *p.* 99. *l.* 14. *r.* is the, *p.* 113. *l.* 18. *r.* other, *p.* 114. *l.* 31. *r.* content.

In the Ephemeris and Tables. P. 3. *l.* 15. *r.* forraign.

January 12. 00197260? Simple Interest.
24. 1.00383872? Compound Interest.
31. 00509890 Sim. Interest. 0849315 Decim. for days.
February 12. 007068493 Simple Interest.
March 16. 9880936 Compound Rebate.
April 9. 1.01592999? Compound Interest.
28 1.01901616? Compound Interest.
June 4. 1.02505301? Compound Interest.
14. .97400316 Compound Rebate.
August 6. 96579693 Compound Rebate.
14. 1.03673757? Compound Interest.
24. 1.03839394? Compound Interest.
October 4. .95644882 Simple Rebate.

In the Table of present worth of Annuities.

30. 15. 37345 at 5 *per Cent.*

Books Printed and Sold by Dixy Page *at the* Anchor *and* Marriner *in* East-Smithfield.

New and Rare Inventions of Water Works, full of Figures, translated out of *French* by Mr. *John Leak*, *fol.*

Mr. *Wrights* Correction of Errors in Navigation, with many Additions, 4to.

The Sea-mans Companion by Mr. *Norwood*, 4to.

The Help to Calculation, wherein are divers Tables of Declination, Right and Oblique Assentions, and the exact Erecting of a Figure, the best extant, 4to.

The Sea-mans Tutor, an excellent Book for Seamen, 4to.

Streets Appendix to his *Astronomia Carolina*, 4to.

The Mathematical Jewel, very useful for Marriners; whereunto is added a Description of the Cross-Staff, and a Catalogue of Eclipses. 4to.

The Antiquity of Astronomie, 4to.

Euclids Elements with Additions, 8°.

Gadburies Nature of Prodigies, 8°. *Cum Multis aliis.*

He buys all sorts of Old-Books, or you may have Old Books new Bound and Clasp't, with Ink of the best.

To the most Reverend Father in God

GILBERT

Lord Archbishop of *Canterbury* his Grace, Primate of all *England* and Metropolitan.

AND

The Right Reverend Fathers in God

HUMPHERY

Lord Bishop of *LONDON*,

AND

HERBERT

Lord Bishop of *Hereford*.

TO your Grace as being in your Province, and to your Lordships, as having dependance upon you in your respective Jurisdictions, I stand obliged to render all dutiful observance of your Commands, and because it may

be said of you, as Saint Paul *saith of himself*, The care of all Churches are upon you, *I, and of all Schools too; therefore I humbly submit these poor thoughts of mine in reference to Childrens Education, to your great VVisdomes and graver Judgments, resolving with my self, that they shall either take life from your countenance, or receive an interment by your sentence: I beg nothing but your pardons for my presumption, and subscribe my self*

Your Graces and your Lordships

humbly devoted

Son and Servant

John Newton.

To the Right Honourable
JOHN Lord Viſcount *Scudamore*,
And the Honourable
James Scudamore his Son and Heir,
Sir *James Bridges*, and Sir *John Kyele* Baronets,
AND
Sir *John Scudamore* Knight of the Honourable Order of the Bath and Baronet,
Sir *William Powel* Baronet.
The Worſhipful
Herbert Weſtphaling, *Bennet Hoskins*, *Henry Milbern*, *Rudhal Gwyllym*, *John Nurſe*, and *William Gregory* Eſquires.

My Lord and Gentlemen,

I Am a ſtranger in this Countrey, an out-corner, I am a ſtranger to ſome of your perſons, and I am perhaps in the judgment of many upon a ſtrange deſign, the Alteration of the Method and of the Matter that is taught in Schools, for which ſome perhaps may cenſure me

as others did the Apoſtles before me, that I am drunk with new Wine, or that I am mad, though not as *Feſtus* ſaid to St. *Paul*, *with much learning*, for this I confeſs, *hoc tantum ſcio, me nihil ſcire*, or thus at leaſt I do expect that it ſhould be ſaid of me, as it was of St. *Paul* and the other Apoſtles, *This is he that turneth the world upſide down.* However I hope that I may in ſome good meaſure ſay, as that Apoſtle did, *I am not mad*, not drunk, nor yet of a turbulent ſpirit, but do ſpeak forth the words of truth and ſoberneſs.

God and the King have placed me here in this Town of *Roſs*, a place eminently ſituate for health, beauty, and worldly advantage, and your Eſtates encompaſs it round, Oh let your Perſons beſiege it with your favourable countenance; there are two things yet wanting to make it happy (a comfortable ſubſiſtence for Gods Miniſter, and a compe-

tent

tent endowment for a good School, without which the other natural advantages of the place, will prove but Inſtrumental to the miſery of the Inhabitants.

But my preſent addreſs to you is in reference only to the latter, ſome countenance and encouragement for a good School, a thing to which ſome of you expreſſed a great forwardneſs, and I hope to find you all of the ſame mind, but I ſhall not uſe many arguments to perſwade you; for when *Tiberius* had a purpoſe to Canonize Chriſt Jeſus, and to admit him into the number of the *Roman* gods, he did to that purpoſe propoſe it to the Senate, but the Senate though inclinable of themſelves to have done Chriſt that honour, did yet forbear it, becauſe the intimation came not from themſelves, but from the Emperour, and ſo it may fare with this good work, if I ſhould be too preſſing in it; what deſire I have had and have yet to ſet it forward,

I will

I will forbear to mention; this only I do declare, that I having by Gods blessing made the way to it a little more smooth by removing some Obstructions, doe now submit these Papers to your perusal and censure, and if either the Matter, or the Method, or the Discipline do displease, I am ready to accept of any other, which you in your judgments shall propound; I would have the whole work to come from your selves; and yet further, if my person be any bar to your good intentions, and this glorious work, I shall very freely lay down mine owne Interest for the Publick good, there is nothing shall give an obstruction to it, from him, that doth desire to subscribe himself

Yours, and his Countries Servant

John Newton.

TO THE READER.

HEre present thee with a strange Treatise, to make a Schol-book; for it may perhaps be asked, *What have Children to do with Interest of Money, or any of those Precepts that tend to the knowledge of it?*

But it will be answered, That it may and will be useful unto many, when they are come near to mans estate. And whether this be the fittest time or not, for their instruction in things of this nature, suspend I pray a little thy judgment, till thou have read and well considered what here is offered in defence thereof.

The Education of Children in the general is granted on all hands, to be a thing of great concernment to a Common-wealth, and any one thing else which can be named; and *Socrates* in *Plato* saith, *That no man goeth about a more godly purpose, than he that is mindful of the good bringing up both of his own, and other mens children*; and hence many persons in former times, and some in our own, have

Plato in initio Theæ.

have ſpent their thoughts, and publiſhed their apprehenſions concerning the erecting and well ordering of Schools Elementary and Grammatical. But this Commendation of *Plato*, is not confined to Grammar learning, or Schooling for Tongues; but is to be underſtood of Childrens Education in the general.

And there is perhaps another kind of Learning, more proper and more beneficial for Children and the Common-wealth, than is the learning of Exotick Languages; not that I would have the Learning of Tongues neglected, but that I would have our own Native Language improved; and I am perſwaded, that if Children were more perfectly inſtructed in that, they would be more apt for other Languages, and ſufficiently fitted and prepared for the learning of Arts and Sciences in their own. And doubtleſs there is nothing that doth ſo much obſtruct the well management of this affair, as doth the poor and inconſiderable reward; the work on all ſides is confeſſed good, but the recompenſe given is ſo ſmall, that it maketh the undertakers to be contemptible, (*probitas laudatur & alget*) contemptible in the general, though ſome few perhaps may be excepted. And that which is yet worſe, the more the pains is, the leſs in proportion is ſtil the reward, witneſs the ſmall pittance generally given, for the teaching of Children to

read:

read: and the advance of recompence is ſtill to thoſe, that make the ſuperſtructure after the foundation is laid, whereas the firſt pains truly taken, ſhould in truth be moſt rewarded, and leſs allowed ſtill upward, as the pains diminiſheth, and the eaſe increaſeth; ſo ſaith the learned *Mulcaſter* in the 41. Chap. of his *Poſitions for the training up of Children*; but he needed not to have ſpoken of any diminution of the Maſters reward, the greateſt that is uſually given, being too little for the leaſt pains that can be truly ſuppoſed to be taken, although according to ſome mens teaching, the leaſt recompence may be too much: for which yet the Parents of Children muſt thank themſelves, becauſe the reward being generally ſmall, able Scholars will not debaſe themſelves to ſo low a ſtipend; and ſo the greateſt and the hardeſt task is left to ſuch, as are the leaſt able to perform it. And Maſter *Aſcham* was not the firſt that did complain of this particular, who in the ſeventh leaf of his *Schoolmaſter*, the firſt part, ſaith thus: *It is pity, that commonly more care is had, yea, and that among very wiſe men, to find out rather a cunning man for their Horſe, than a cunning man for their Children; They ſay nay in word, but they do ſo in deed, for to the one they will gladly give a ſtipend of two hundred Crowns by the year, and loath to offer to the other two hundred ſhillings. God that*

ſitteth in Heaven, ſaith he, *doth laugh their choice to ſcorn, and rewardeth their liberality as it ſhould; for he ſuffereth them to have tame, and well ordered Horſes, but wild and unfortunate Children: and therefore in the end they find more pleaſure in their Horſes, than comfort in their Children.*

In Editione Francofurt. 1620. p. 4. And *Plutarch* in his Treatiſe concerning Childrens Education, ſaith thus, *When they are of age fit for Tutors, we ſhould not ſend them to the baſeſt that can be had, imploying all others in our worldly buſineſs, no not for the deſire of friends: Wilt thou,* ſaith he, *put thy life into a fools hand, either in thy Sick-bed, or in a Storm, for the requeſt of a friend, when thou mayeſt have a good Phyſician and a skilful Pilot? and yet, as if thy Children were of no account, thou wilt put them to School to vain, vicious, and ignorant Tutors, and this perhaps to ſave thy purſe: What is this but to ſeek a good Market, where thou mayeſt buy Ignorance at the cheapeſt rate?* *Marcus Antoninus* the *Roman* Emperour, was not of this parſimonious temper, for in the beginning of the firſt Book of his *Meditations,* he ſaith, *I have learned from my Grandfather, both to frequent publick Schools and Auditories, and to get me good and able Teachers at home, and that I ought not to think much, if upon ſuch occaſions, I were at exceſſive charges.* As for ſuch therefore as are able, and will not be perſwaded to allow a competent recompence for their

Childrens

Childrens Education; I will only wish them to consider what *Aristippus* (in *Plutarch* in the place before cited) said to one that asked him, what he would take to train up his Son, who answered, *An hundred Crowns*; *An hundred Crowns*, saith the Father; *I swear by* Hercules, *that you ask too much out of the way, for with an hundred Crowns, I could buy a good Slave.* True saith *Aristippus*, *lay out this hundred Crowns so, you may have two, your Son for one, and him you buy for the other.*

The want of due encouragement to the Master, is indeed the great obstruction of our Childrens better Education; the first foundation being weakly laid, the Superstructure cannot be so firm and perfect, as might be otherwise expected; the Elementary part of Learning being but weakly performed, the Grammatical also doth too generally fail, *and yet it is the great* DIANA *of the* EPHESIANS, all other Education of Children being, if not totally despised, yet much neglected: when yet perhaps upon maturer consideration, it will be found, that that is most neglected, which can in truth be worst spared, worst in the general, though not to all particulars. It is our Mother Tongue that is likely in the practice to be most useful, nor is the preservation thereof in its own purity to be esteemed a small part of our Countries honour. And therefore the *Roman* Senate, the

wiſeſt and moſt Venerable Aſſembly of the World, judging it to be no leſs advantagious for the Republick to amplifie their Language, than to extend their Frontiers, reſolved (as one in an Oration told that great Polititian of our age in *France*, Cardinal *de Richlieu*) *to make it as univerſal as their Domination: for the effecting of which glorious deſign, they ſent out Colonies*, ſaith he, *into all parts, and gave the greateſt Cities of theſe Countries, which they had conquered, the priviledge of* Roman *freedom, to oblige them to ſpeak their Language, without which they might not be capable of bearing any Office in the Commonwealth. They alſo made Decrees, that no forraign buſineſs, Suits and Embaſſies ſhould be diſcuſſed in the Senate, but in Latine, their Provincial Laws ſhould be written in it, and their Pretors and Governors of conquered Provinces ſhould give Judgment in no other Language. It was a Policy religiouſly obſerved by the Roman Magiſtrates, never to give any Audience to any ſtrange Language, denying that priviledge even to the* Greek; *though it were famous, and celebrated among them. And* Antoninus *the Emperour, did not only command the* Gauls *(who were then the ſubjects of the* Roman *Empire) to learn the* Latine, *and to plead therein, and to make thoſe Hymnes, which they ſung in their Sacrifices, in that Language; but forbad them likewiſe to treat of any Matters, with the Emperours by means of any Interpreter*; ſaying,

It

It was a thing miss-beseeming Roman *greatness, to be spoken to, by a subjects language. And not the* Romans *only, but the* Arabians, Turks, *and* Spaniards, *have been very zealous for the preservation of their own Tongue or Speech.*

And we find in History, that there are four principal ways, by which Languages may be not only preserved, but brought to perfection.

1. By Arms, when the Conquerours bind the vanquished, to speak his language; but thus they can be extended no further, than the bounds of their Conquests, nor last any longer than their own power.

2. By Translation of Writers, whereby we change and transform into our own language, the rare inventions, rich conceits of other Nations, making them speak such an *Idiom* as they never understood.

3. By Grammar, by which we learn to decline and conjugate, read and pronounce in all places in one manner; but both these have also their bounds.

4. By making them to be the Interpreters of Arts and Sciences, and this is indeed the way, to make them lasting and perpetual; no sooner are Arts and Sciences brought into a National language, but they grace it with all necessary ornaments, and make it every way compleat; *And in time*, saith *Mulcaster*, *all learning may be brought into*

Chap 41. pag 242. one Tongue, and that natural to the Inhabitant, so that Schooling for Tongues may prove needless, as once they were not needed; but it can never fall out, that Arts and Sciences in their right nature, should not be necessary for any Common-wealth, that is not given over unto too much barbarousness. We do attribute, saith he, too much to Languages, which do mind them more than we do matter, chiefly in a Monarchy, and esteem it more honourable to speak finely, than to reason wisely, where words be praised for the time, and wisdom wins at length. Page 245. Nor is speaking of Latine, saith he, any necessary Argument of deeper Learning. And even that, or any other Language, (except our Native) are quickly lost again, if we give over the use of them: but Arts and Sciences once learned, do for the most part remain for ever, and have been therefore taught in National and Mother-Tongues, by the Gauls, Egyptians, Persians, Græcians, and indeed by all Nations from the first Creation of the World, to the time of Charls the Great; and if any help were borrowed of forraign Languages, they were such as were still in use, and had their course among the learned, who were consulted with, as so many Oracles, and this was but for a time, until their own language was brought to perfection, and that they had invented terms enough for all Sciences. By this means those Nations which studied Philosophy, in their own Mother Tongue,

became solid in Learning and eloquent betimes, and have left behind them solid and eloquent works. *Galen* studying in his own Tongue, happily attained to perfection, and was both a Mathematician, a Philosopher, and a Physitian, in fifteen or sixteen years, as well as divers others of his time. And *Aristotle* in his Politicks saith, *That Children are capeable of Learning Philosophy, at seven or eight years of age. But how uncapable of learning Grammar, I dare not say, it being the only Education, in this our Age so much admired; how useless Grammar is to many thousands of Children, experience sheweth.*

For most Children being removed from School, before they attain to any degree of perfection in it, do in a short time totally forget it; and not being well instructed in their own Tongue, do seem even in their riper years to be strangers to it, and do retain the ill tones, and unsavoury pronunciations of their several Countries, in which they had their Education; nay, I could instance in some, that had Grammar and other Learning enough for their admission into the University, and yet were not able laudably and distinctly, to read an *English* Chapter, either in the Old or New Testament. When yet in the *Egyptian*, *Grecian*, and *Arabian* Schools, Children were wont laudably to finish their study of Mathematicks and Philosophy, at fourteen or fifteen

years

years of age, being ſufficiently inſtructed in them before they were of age, to undertake that profeſſion whereunto they were intended, for their livelyhood and imployment. All the parts of Philoſophy and Mathematicks, are certainly applyable unto the neceſſity of living, and welfare of Common-wealths, without the help of Exotick Languages, which are not gained but by exceſſive pains, and quickly loſt again without continual practice.

But all this while, I am ſpeaking of an honour which ſome perhaps may earneſtly wiſh were done our Nation, but cannot expect that ever it will; to effect all this is beyond my power, yet ſomething towards it I would, if I might propound and proſecute.

Well then, notwithſtanding all that hath been ſaid, or might be added, to perſwade the teaching of Arts and Sciences to our Children, in our Native Language, Schooling for Tongues muſt ſtill be uſed, for this are moſt of our Schools erected, and the foundation muſt not be altered. But why other Schools may not be founded as an Introduction unto theſe, or why our Grammar School-maſters, ſhould not themſelves, begin with the firſt and meaneſt part of Learning, the teaching of Children to read, I muſt confeſs my ſelf unable, ſufficiently to ſatisfie my own reaſon, fit it is that it ſhould be

well

well done, and they to whom this work is generally referred, are not able to perform it: and I fear two Schools in one and the ſame place, one for Grammar, and the other ſubſidiary to it, will be very rarely found, and therefore the whole work for the moſt part, muſt be performed by the ſame Maſters, in one and the ſame School.

And now the Queſtion is, What Method the Maſter and Uſhers in ſuch a School were beſt to follow; whither that which ſhall with moſt ſpeed fit thoſe Children for the Univerſity, or ſome learned Profeſſion, as in the Method now in uſe they generally are? or whether ſome other Method ſhall be preſcribed, that ſhall be more beneficial to the others Scholars, whoſe Parents abilities will not permit, them to keep their Children ſo long at School, as is required for the former purpoſes? Reaſon I think will ſay, that the Method of a School ſhould be ſuch, as is likely to be beneficial to the moſt, and that cannot be the Method now generally uſed; for where there is one trained up in our Grammar Schools, to any perfection fit for the Univerſity, or any learned Profeſſion, there are an hundred taken away before, of whom the moſt very ſhortly after, do in a manner wholly forget their Grammar learning: ſo that if ſomething elſe beſides Grammar be

not

not taught to these, their time spent at School, if it be not utterly lost, will yet be spent to little purpose.

To redress this inconvenience, this mischief rather, the time that is usually spent at School, for the fitting of Children for the University, would be considered, which is about ten or eleven years; for children do not ordinarily begin to know their letters until they be about four or five years old; nor are they generally sent to the University until fifteen, very many not till they are sixteen compleat; nay, and perhaps that is too soon. And are there any that think it fit to teach Children the *Latine* Tongue before they know their own? there are that think they should attain to good perfection, not only in reading, but in writing of their Mother Tongue, before they be put to any other, and as a *Cousen Germain* to fair Writing.

Cap. 4. & 34. *Mulcaster* adds the drawing with Pen or Pencil; *For Pen and Penknife*, saith he, *Ink and Paper, Compass and Ruler, a Desk and a Dust-box will set them up both, and in these young years, while the finger is flexible, and the hand fit for frame, it will be fashioned easily.* And what if I should add all manner of Lines and Mathematical Figures, and the signification of all Numerical Figures; nay, the Arts of Arithmetick and Geometry. But this perhaps will be exploded, because some

wits moderate enough by nature, are (as Mr. *Aſcham* ſaith in the firſt Book of his teaching, *fol.* 4.) many times marr'd by over much ſtudy and uſe of ſome Sciences, namely, *Muſick*, *Arithmetick*, and *Geometry*. *Theſe Sciences*, ſaith he, *as they ſharpen mens wits overmuch, ſo they charge mens memories over-ſore, if they be not moderately mingled, and wiſely applyed to ſome good uſe of life. Mark all Mathematical heads*, ſaith he, *which be only and wholly bent to theſe Sciences, how ſolitary they be themſelves, how unfit to live with others, and how unapt to ſerve in the world.* This is not only known now by common experience, but uttered long before by wiſe mens judgments and ſentence. *Galen* ſaith, *Much Muſick marreth mens manners*: and *Plato* hath a notable place of the ſame thing in his Books *De Republica*, well marked alſo, and excellently tranſlated by *Tully* himſelf: Thus far Mr. *Aſcham*, enough perhaps to drive my Reader out of conceit with theſe Sciences; yet hear I pray, and then judge, the learned *Mulcaſter* was of another mind, he ſaith, *That the Mathematicks had the place, before the Tongues were taught, which though they be now ſome neceſſary helps, becauſe we uſe Forraign Language for conveyance of Knowledge, yet they puſh us one degree further off from Knowledge.* That the Mathematicks had the place, and were propoſed to Children, he that hath read any thing in Philoſophy, Chap. 42. pag. 247.

ſophy cannot be ignorant. *Plato* is full o it, and termeth them commonly, *The Childrens Entrance*, but chiefly in the ſeventh Book of his *Common weal*; and to ſay the truth, ſaith he, *Let any man mark the courſe of all ancient Learning, and he ſhall find that it could not be poſſibly otherwiſe, but that the Mathematicks were their rudiment; though no Hiſtory, no deſcriber of Common weal, no ſetter forth of Philoſophers life, no Philoſopher himſelf had told it us.* Is not *Ariſtotle's* firſt Book of all ſtyled his *Organum*, which containeth his whole Logick? and in his proofs for picking out of his Syllogiſms, doth he not bewray, wherein he was brought up? *I uſe* Ariſtotle *alone*, ſaith he, *becauſe our Students are beſt acquainted with him*; whom yet they cannot underſtand without theſe helps, as one *Braverdine* eſpyed well, though not he alone, who took the pains, to gather out of *Euclide*, two Books purpoſely for the underſtanding of *Ariſtotle*. Can his Books of *Demonſtration*, the *Analytica Poſteriora* be underſtood without this help? His whole Treatiſe of *Motion*? His *Confutation* of others *by nature of Motion and Sight*? His *Mathematical Deſcriptions* in many places? His *Natural Theorems* each where? Can they be conceived, much leſs underſtood by any ignorant in this point? Wherein *Ariſtotle* ſheweth us his own Education, to whom he commendeth the like; if we like of him, whoſe liking

liking will not fall, though fools oft-times ſhake it. *It were Infinite*, ſaith he, *to uſe proofs in ſo general, and ſo known a caſe, which the whole Antiquity ſtill allowed of, and the famous* Athenian *Common-wealth uſed even then, when ſhe had the great brood of the moſt excellent perſons, for her ordinary train to her youth,* as *Socrates* ſtill alleadgeth in *Plato*, or rather *Plato* fathering the ſpeech upon *Socrates*, ſaith ſo himſelf. *Ariſtippus after his ſhipwrack found relief through that train, and encouraged his Companions upon ſight of Geometrical Figures in the ſand.* He that will judge of theſe Sciences in general, and wherein they be profitable to all other ſtudies whatſoever, let him read but, either *Proclus* his four Books upon *Euclides* firſt in *Greek*, or becauſe the *Greek* is ill and corruptly printed; *Johannes Barocius*, a yong Gentleman of *Venice*, which hath turned them into *Latine*, and corrected the copy. Though many have dealt in the Argument, they be but ſecondary to *Proclus*; for he handleth every queſtion, that either makes for them, or againſt them, chiefly in his firſt Book. *It were too much for me*, ſaith he, *to ſtand upon Enumeration of Teſtimonies in this place, that the ancient Schooling did begin at the Mathematicks, after the firſt and Elementary, while they minded ſound Learning indeed, and ſequeſtred their thoughts from other dealings in the world.*

And

Chap. 41. pag. 243

And for Answer to that Opinion of Master *Ascham*, which I recited but now; I shall say no more than what *Mulcaster* hath said to the same objection, his words are these; *For the credit of these Mathematical Sciences, I must needs use one Authority of great and well deserved countenance among us, and so much the rather, because his judgment is so often, and so plausibly touched, by the courteous Mr.* Ascham *in his Book, which, I wish, he had not himself, neither any other for him, entituled the Schoolmaster, because my self,* saith he, *dealing in that Argument, must need sometime dissent too far from him, with some hazard of mine own credit, seeing his is hallowed.*

The worthy and well learned Gentleman Sir *John Cheek*, in the midst of all his great learning, his rare eloquence, his sound judgment, his grave modestie, feared the blame of a Mathematical head, so little in himself, and thought the Profession to be so far from any such taint, being soundly and sadly studied by others, as he bewraied his great affection towards them most evidently in this his doing.

Being himself Provost of the *Kings-Colledge* in *Cambridge*, in the time of his most honored Prince, and his best hoped Pupil, the good King *Edward*, Brother to our gracious Soveraign Queen *Elizabeth*, he sent down from the Court on Mr. *Bukeley*, sometime fellow of

the ſaid Colledge, and very well ſtudied in the Mathematicks, to read Arithmetick and Geometry to the youth of the Colledge: and for the better encouraging of them to that ſtudy, he gave them a number of *Euclides* of his own coſt. And a little after he ſaith thus; *Can he then miſlike the Mathematical Sciences, which will ſeem to honour Sir* John Cheek, *and reverence his Judgment? Can he but think, the Opinion to proceed from wiſdome, which accounteth* Socrates *the wiſeſt Maſter? Nay, how dare he take upon him to be a Maſter not of Art, but of Arts, (for ſo is the name) which hath not ſtudied them, ere he proceeded; are not the proceeders to read in any of theſe Sciences publickly, by the Vice-Chancellours appointment, after they have commenced? And do they not promiſe and profeſs the things, when they ſeek to procure the Titles? And with what face dare Ignorance open her mouth, or but utter ſome ſound of words, where ſhe hath profeſſed the weight of matter? ſo that the very Univerſity her ſelf doth highly eſteem of them, if ſhe could intreat her people to eſteem of their Mothers Judgement.*

Theſe Sciences bewray themſelves, in many Profeſſions and Trades, which bear not the Titles of Learning, whereby it is well ſeen, that they are no prating, but profitable grounds; not gay to the ſhew, but good to be ſhewed, and ſuch means of uſe, as the uſe of our life were quite maimed

Pag. 245. without them. And yet a little further in defence of these Sciences, he saith thus, *Though such as understand them not, do mislike them, which yet is no reason in them, nor any disgrace to the thing misliked by them, seeing ignorance misliketh: yet those that understand them, may boldly mislike the mislikers, that oppose the whole Ancient Philosophy, and all well appointed Common-wealths, against such mock Mathematicians, without whose help they could not live, nor have houses to hide their heads, though they thank not their founders.*

My Reader I hope by this time, will begin to think, that it is at least convenient, if not necessary, that Mathematical Arts and Sciences should be taught our Children, since they are so necessary for our Carpenters, Masons, Shipwrights, Mariners, and other Trades and Occupations, among whom, but few can keep their Children so long at School as will be necessary for the gaining of the *Latine* Tongue; But in these Sciences were they taught in their natural language, they might be competently instructed, before they were eleven or twelve year old, and others whose Parents are of greater ability, and consequently, do desire to give their children some further education, the keeping them so long in these rudiments, would be no great obstruction, for there will yet remain four or five years, of that time usually spent at School, for

their

their learning of the *Latine* and *Greek* Tongues. And there are many in this Kingdom that do pretend to teach them in a ſhorter ſpace. The Author of *Fax Nova* in his Epiſtle to the Reader ſaith, *That a diligent Learner, though otherwiſe of a mean wit and judgment, may in that method in three years time at the furtheſt, be made fit for the Univerſity.* How ever in four or five years time, ſuch Preparations being made for it, as in the teaching of *Engliſh*, and theſe Sciences may eaſily be done: I do not doubt, but that the children may be ſent to the Univerſity as fully inſtructed in theſe Languages, as now they are; although now they have not theſe Sciences for their obſtruction, as ſome think they would be; though I for my part am perſwaded, that they would in ſome ſort prove a furtherance to them.

This then is that which I would propound. Let all Children be fitted for common Trades, and then as many ſet forward in other learning, as can ſpare time for it, and be at the charge of it.

But this alas is our miſery, we want Maſters to teach theſe things in Schools: for writing, we have indeed many Maſters that are excellent; but as for Arithmetick, to the ſhame of them that profeſs it, how few have we that underſtand all the parts of that which is called Vulgar, but as for Decimal Arithmetick, Artificial by Logarithmes and Algebra, there are too many that have

ſcarce heard of their Names; and I never yet heard of any Grammar School in *England*, in which it is taught; nay, it is well, if the Maſters themſelves have enough for their houſhold occaſions, I, and ſo rarely is it ſtudied in the Univerſity, that I doubt it is not poſſible to be furniſhed from thence, with ſuch School-maſters as are indeed able to teach theſe Sciences, and all for want of ſome encouragement to that purpoſe; and I cannot indeed ſufficiently admire (there being ſo many Seamen in former ages and in our own, that have by Navigation ſo well improved their own fortunes) that there ſhould not be, ſo much as one School endowed in *England*, for the teaching of theſe things.

In order to ſuch an undertaking, there are ſome Books already publiſhed, by others and my ſelf, and time perhaps may bring forth many more, were there but a School to teach theſe Sciences in. As for Arithmetick Vulgar, Decimal and Artificial by Logarithmes, Mr. *Wingate* hath done ſo well that it is but needleſs to name more, as for Geometrical Elements take mine, till ſome more able Pen ſhall furniſh thee with a better; and take this alſo compoſed chiefly, to ſhew unto Children and unto Tradeſmen, the uſe of Decimal Fractions, and Table of Logarithmes, in ſuch queſtions as are moſt proper for them; as in queſtions of Intereſt

and

and Rebate of money, and Annuſties, and in meaſuring of Glaſs, Board, Timber, Stone, and ſuch like, and may ſerve as an eaſie Introduction to the knowledge and uſe of the Line of Numbers, commonly known by the name of *Gunter's Line*, now frequently ſet upon the Carpenters Rule, though few underſtand the uſe of it, and almoſt none of them the conſtruction; but if our Schoolmaſters would make it their buſineſs, to ſtudy theſe things themſelves, and then inſtruct their Scholars in them; I doubt not, but that in a ſhort time, we ſhould be furniſhed with Tradeſmen and Navigators, able to compare with any part of the world, either for skill or number.

And here I thought to have ended, but Grammar learning, or Schooling for Tongues muſt not be quite left out, and yet that little that I ſhall ſay, will not perhaps be very pleaſing, unto the moſt our of Grammarians in this our age: Schooling for Tongues I like well, and could heartily wiſh, that it might be brought to a greater degree of perfection, than yet it is, but I very much doubt, whether as yet we be in the way to that great end.

There are at this day three things (which as I ſuppoſe) obſtruct and hinder us, The variety of Grammars: the method of teaching them: and the harſh and ſevere Diſcipline uſed in Schools.

Variety of Grammars (which is now re-entered our Schools) was in uſe among us in former times, for thus we read in the Epiſtle before the common Accidence, they who profeſſed this Art of teaching Grammar, did teach divers Grammars and not one, and if by chance they taught one Grammar, yet they did it diverſly, and ſo could not do it all beſt, becauſe there is but one beſtneſs, not only in every thing, but alſo in the manner of every thing. As for the diverſity of Grammars, it is well and profitably taken away by the Kings Majeſties wiſdom, who foreſeeing the inconvenience, and favourably providing the remedy, cauſed one kind of Grammar by ſundry learned men, to be diligently drawn, and ſo to be ſet out only, every where to be taught for the uſe of learners, and for avoiding the hurt in changing of Schoolmaſters. The variety of teaching is diverſe yet, &c.

This variety of teaching, the learned and judicious *Mulcaſter* in his Epiſtle of Dedication to Queen *Elizabeth* doth much complain of, ſaying thus; *The end of my whole labour is, to help to bring the general Teaching in your Majeſties Dominions, to ſome one good and profitable uniformity, which now in the midſt of great variety doth either hinder much, or profit little, or at leaſt nothing ſo much as it were like to do, if it were reduced to one certain form. The effecting whereof pretendeth*

eth great honour to your Majeſties Perſon, beſides the profit which your whole Realm is to reap thereby. That Noble Prince King *Henry* the Eighth, vouchſafed to bring all Grammars into one form, the multitude thereof being ſome impediment to School-learning, in his happy time, and thereby both purchaſed himſelf great great honour, and procured his ſubjects a marvellous eaſe. *Now if it ſhall pleaſe your Majeſty,* ſaith he, *by that Royal example, which otherwiſe you ſo rarely exceed, to further not only the helping that Book to a refining: but alſo the reducing of all other School-books to ſome better choice, and all manner of teaching to ſome readier form: Can ſo great a good, but ſound to your Majeſties moſt endleſs renown, whoſe leaſt part gave ſuch cauſe of Honour to that famous King your Majeſties Father?*

The bringing of all Grammars into one form, this learned man you ſee approves of, but the refining of that Grammar then commanded, he ſeems to deſire from that Authority, to whom of right it doth belong, others have adventured to mend it, as they they think, by laying it aſide, and uſing other Grammars inſtead thereof, when yet perhaps they have laid aſide a better to take a worſe; however the doing thereof without leave from the Supream Authority, nay againſt it, is a greater crime than they perhaps then thought of; and therefore Biſhop

Buckeridge examining a Free School in his Dioceſs of *Rocheſter*, and finding that the Scholars were utterly ignorant of *Lilies* Rules as uſed to others, preſently cried out, *What are there Puritans alſo in Grammar*, ſee Doctors *Fuller's Church Hiſtory, lib.* 5. *pag.* 168. What would this Reverend Father have ſaid, had he lived to ſee that Faction prevail, and as many Grammars publiſhed almoſt, as there are opinions in Religion; nor are we yet, upon the happy return of his Majeſty to theſe his Dominions, ſo univerſally returned to our obedience in this particular, as might be wiſhed; nay, where this Grammar ſet forth by the Kings Authority is received, the method preſcribed for teaching thereof, I think is no where followed, the method is this; The firſt and chiefeſt point is, that the diligent Maſter make not the Scholar haſt too much, but that he in continuance and diligence of teaching, make him to rehearſe ſo, that while he hath perfectly that which is behind, he ſuffer him not to go forward; and in going forward, let him have of every Declenſion of Nouns, and Conjugation of Verbs, ſo many ſeveral examples, as they paſs them, that it may ſeem to the Schoolmaſter no word in the *Latine* Tongue to be ſo hard for that part, as the Scholar ſhall not be able praiſeably to enter into the forming thereof. This when he can do, let him paſs to the Concords, to know

know the agreement of Parts among themſelves; with the like way and diligence as is afore deſcribed. When theſe Concords be well known unto them, let them not continue in learning of their Rules orderly, as they lie in their Syntax, but rather learn ſome pretty Book, wherein is contained not only the Eloquence of the Tongue, but alſo a good plain leſſon of honeſty and godlineſs; and if there fall any neceſſary Rule of the Syntax to be known, then to learn it, as the occaſion of the Sentence giveth cauſe that day.

This is the teaching of Grammar, which ſeemeth to be preſcribed by Authority, this I approve of in it ſelf, and ſo much the rather becauſe commanded: And I have the concurrent judgment of Mr. *Aſcham* in this point, who ſeems to be condemned by ſome, for being in this, obedient to the Kings command; for *folio* 2. *Part.* 1. of his Schoolmaſter thus he ſaith, *We do not contemn Rules, but we gladly teach Rules, and teach them more plainly, ſenſibly, and orderly, than they be commonly taught in Common Schools:* for when the Maſter ſhall compare *Tullies* Book, with the Scholars Tranſlation, let the Maſter at the firſt, lead and teach his Scholars to joyn the Rules of his Grammar Book, with the examples of his preſent Leſſon, until the Scholar by himſelf be able to fetch out of his Grammar, every Rule for every Example,

ample, ſo as the Grammar Book be ever in the Scholars hand, and alſo uſed of him as a Dictionary for every preſent uſe; this is a lively and perfect way of teaching of Rules, where the common way uſed in common Schools, to read the Grammar alone by it ſelf, is tedious for the Maſter, hard for the Scholars, cold and uncomfortable for them both. Thus far Mr. *Aſcham*, and while this way of learning Grammar is continued, I ſay again, I much doubt whether we be yet in the way, of teaching Children the *Latine* and *Greek* Tongues.

You ſee what is preſcribed, and you hear what Mr. *Aſcham*'s judgment was; hear now Saint *Auſtin*, the honour of *Africk* and of the Church, who could eaſily comprehend and penetrate into any thing; he complains in divers places, and eſpecially in his Confeſſions, of the difficulty that he found, in learning the *Greek* Tongue by Precepts, and averreth, that it cannot be inculcated into the memory, without rough threatnings and ſevere corrections, which dulleth the courage of a child and diſtracteth his ſenſes, he ſaith alſo, that he found more diſtaſt than pleaſure, in reading of *Homer* himſelf, though it was ſo full of variety and recreative, and pleaſant fictions; and that contrariwiſe he learned the *Latine* Tongue, in ſporting among women and children, though it was no more natu-

Lib. 1. Confeſ. cap. 14.

ral

ral unto him than the *Greek*, becauſe he was ſent to learn it, in a City of *Africk*, which was a *Roman* Colony, and where they did ordinarily ſpeak it.

The learnedſt among the *Grecians* in former times, were wont to blame the Grammarians, who beſtowed ſo much time in teaching of Grammar, but what would they ſay, if they ſaw now the diſorders of our Schools. *Longum iter per præcepta, breve & efficax per exempla*, ſaith *Seneca*, a long way by Precept is by example oft-times made ſhort and eaſie. *Quod, magnus Scholarum per Germaniam Reformator, Lubinus, his expreſſit verbis. Jamdudum, inquit inſaniviſſe mihi videntur illi, qui præcepta Gramatices in ſe obſcura, inſuper verſibus incluſa pueris propoſuerunt; verſibus inquam adeo obſcuris, ut etiam nobis ætate provectioribus, ad intelligendos illos Oedipo quodam opus eſſe videatur. Fax Nova in Præfat.* All Languages ought certainly to be learned by Practiſe, not by Precept, and the Grammar, as I ſaid before ſhould be uſed as a Dictionary not learned as an Author, if any think otherwiſe, let them produce their reaſons, and ſhew, if they can, a better effect of learning by Precept than by Examples, as yet theſe numberleſs Teachers of *Greek* and *Latine* by Grammar Rule, have not made theſe Languages familiar in any Colledge: I ſuppoſe the choiceſt Scholars, of all the Schools in *England*, have been from time to time

time sent to the University for their further Education, in which as yet there is almost as little *Latine* spoke, as in inferiour Schools. I will not say how much this doth redound unto the dishonour of our Nation; but if the speaking of *Latine* were enjoyned there, it would in a little time grow so natural, that there would need but little schooling for it, and the younger years of Scholars, might be spent in Arts and Sciences, and that in either language, because the *Latine* would be as ready to them then, as their native language now.

Till this can be effected, these Languages must be taught in Grammar Schools, I think they should be taught in the method prescribed by Authority, but that the teaching of them should make us neglect our own, that our learning of *Latine*, which is, as I have said, useful but for some few, should keep us from learning of Arts and Sciences, especially such as are useful unto all, is certainly unreasonable in it self, and prejudicial to those children that might otherwise be enabled to get their living, with far more ease than now they can, and with greater advantage and honour to themselves, their family and the Common-wealth.

There is one thing more in the management of this affair, that may perhaps deserve some consideration, and that is the discipline now used in Schools. And the

judgment

judgment of *Plutarch* in this particular, though a Heathen, is not I think to be despised; he saith, *That Children must be trained up, and brought to their duty in all lenity, by fair words, gentle exhortations, and mild remonstrances, and in no wise by stripes and blows, for this course of swinging and beating, seemeth meet for Bondslaves, rather than persons of free Education. And to say the truth,* saith he, *by this means they become dull and senseless, nay, they have all study and labour afterward in hatred and horrour; partly for the smart and pain, which they abide by such correction, and in part by the contumely and reproach that they sustained thereby, praise and dispraise be far better, and more profitable to children free-born, than all the whips, rods, and boxes in the world; the one to drive them forward to well-doing, the other to draw them back from doing ill: but both the one and the other are to be used alternately, one while they would be commended, another while blamed and rebuked; and namely, if at any time they be too jocund and insolent, they ought to be snibbed a little, and taken down, yea, and put to some slight shame, but soon after raised up again by giving them their due praise. And herein,* saith he, *we must imitate good Nurses, who when they have set their Infants a crying, give them the breast to still them again. Howbeit a measure would be used, and great heed taken, that they be not too highly commended, for fear least they* Plutarchi Moralia de Educatione puerorum, p. 8. & 9.

grow

grew proud, and presume overmuch of themselves, for when they be praised exceedingly, they wax careless, dissolute and enervate; neither will they be willing afterwards to take more pains.

And Mr: *Ascham* in the Preface to his *School-master*, upon the report that divers Scholars of *Eaton* were run away from School for fear of beating, telleth us the opinion of Sir *William Cecil*, Secretary to the Queens Majesty, namely, *That School-masters many time, punish rather the weakness of nature, than the fault of the Scholar; whereby many Scholars, that might else prove well, be driven to hate learning, before they know what learning meaneth; and so are made willing to forsake their Book, and be glad to be put to any other kind of living.* And one Mr. *Wotton* being present at that Discourse, inclined to Mr. Secretaries judgment, and said, *That the School-house should be indeed, as it is called by name* Ludus literarius, *the house of play and pleasure, and not of fear and bondage*; and therefore to one who said, *That the Rod was the Sword, that must keep the School in obedience, and the Scholars in good order*; made this reply, *If a Rod carry the fear of a Sword, it is no marvel if those that be fearful of nature, choose rather to forsake the play, than to stand alwayes within the fear of a Sword, in a fond mans handling.* And *Socrates* in *Plato* saith, *That no learning ought to be learned with bondage;*

In Editione Francofurt. lib 7 de Repub. pag. 706.

bondage;

bondage; for bodily labours wrought by compulsion hurt not the body, but any learning learn'd by compulsion tarrieth not long in the minde; and why? whatsoever the mind doth learn unwillingly with fear, the same it doth quickly forget without care: And therefore bring not up, saith he, *your children in learning by compulsion and fear, but by playing and pleasure.* And upon these words Mr. *Ascham* in his Schoolmaster, *Part* 1. *fol.* 10. telleth us, *That fond Schoolmasters neither can understand, nor will follow this good counsel of* Socrates, *but wise Riders in their office can and will do both; which is the only cause, that commonly the young Gentlemen of* England, *go so unwillingly to School, and run so fast to the Stable: for in very deed, fond Schoolmasters by fear, do beat into them the hatred of learning, and wise Riders by gentle allurements, do breed them up in the love of riding. They find fear and bondage in Schools, they feel liberty and freedom in Stables, which causeth them utterly to abhor the one, and most gladly to haunt the other.* And a little after, he maketh instance of that noble Lady, the Lady *Jane Grey*, who by the gentleness of her Master, Mr. *Elmer*, was brought in such love with learning, that he found her reading *Phædon Platonis* in *Greek*, when her Parents the Duke and the Dutchess, with all the household Gentlemen and Gentlewomen, were hunting in the Park, nay, and she thought all their sport in the Park, but a shadow to

that

that pleasure she found in *Plato*, and pitying of them she said thus; *Alas good folk they never knew what true pleasure meant.* And on the other side, by reason of her Parents severity, she took no delight in sowing, playing, dancing, or any thing else of that nature; and thus by wise mens judgments and experience, you see the Discipline most befitting Schools; I might add many reasons more, and many examples, to shew why Learning should be taught by love rather than fear, but *John Sturmius* hath written a learned Treatise to that purpose, *De Institutione Principis*, and therefore unto that, I shall and do refer my Reader.

Who, brought into Schools this horrible severity, at this day practised in this Nation, (and I think more here than in any other) is not easie to determine; but that the hard and uncomfortable Method, now in use for teaching Grammar, might give the occasion, is more than probale. And *S. Austine* seems to be of the same mind, for speaking of the difficulty that he found in learning the *Greek* Tongue by Precepts, averreth that it cannot be inculcated into the memory, without rough threats and severe corrections, which dulls the courage of a child, and distracteth his fences: And who will not now decry, that Discipline and Method, that seem to be yoaked together, to the great hazard, if not to the total ruine of the youth

of

of our Nation. In the 21. year of *Edward* the fourth, *fol.* 6. A Queſtion is put, whether a Schoolmaſter may beat his Scholar for negligence, or default; ſee my Lord *Brooks Abridgment in little Treſpaſs*, *Titulo* 349. But it is grown into an horrid practice now, that he would be laughed at, that ſhould but queſtion it, when yet perhaps, there are ſuch inſtances to be made in this Kingdom, that it is but time, that ſome of theſe ſevere Maſters were made examples to all Poſterity. But what may ſome ſay, Muſt not Children be corrected then, for doing ill? I ſay not ſo; but I could wiſh it might be with more diſcretion, and moderation, than is commonly ſhewed, and in reference to their learning, as little beating as may be.

But ſee the ſtrange practice of this Nation in this particular; when our Children are of that age which is moſt flexible, and may with mildneſs be moſt eaſily wrought upon, then we uſe ſeverity; and when they come to thoſe years, in which there is more danger of being undone, then lay the reins in their necks. This was not the practice of the noble *Perſians*, they brought up their Children in learning, and in exerciſes of labour, and that in ſuch places, where they ſhould neither ſee that which was uncomely, nor hear that which was diſhoneſt, until they were one and twenty years old; nay,

indeed a young Gentleman was never free, till he was either married, or called to bear some Office in the Common-wealth. And *Plutarch* in his Treatise of *Childrens Education*, *pag.* the 12. saith thus; *Many a time, I have complained of those who have brought up divers ill customs, and this above the rest, namely, to provide for their Children while they be very young and little, Masters, Teachers, and Governours: but after they are grown once to some years, they give them head, and suffer them to be carried away with the violent heat of youth: whereas contrariwise, it were meet and needful to have a more careful eye unto them, and to hold a straighter hand over them all that time, than during their infancy and childhood: for who knoweth not, that the faults of young Children are but small, light and easie to be amended; as for example, some shrewdness and little disobedience to their Tutors, and Governours, or happily, some negligence and default in not giving ear to their Teachers, and not doing as their Masters appoint them: But contrariwise, the offences that young men commit, are many times outragious and hainous, as germandising and surfeiting, robbing of their Fathers, Dice-play, in Masks and Mummeries, excessive in feasting, banqueting, quaffing, and carousing, wanton love of young Maidens, Adulteries committed upon married Wives, and thereby the overthrow of Houses, and confusion of Families. In regard of which enormities,*

it

it behoveth Parents, to repress and bridle their wilde and untamed affections with great care and vigilance: for this flour of age having no forecast of thrift, but set altogether upon spending, and given to delight and pleasures, winseth and flingeth out like a skittish and unruly Horse, in such sort, that it had need of a sharp bit, and short curb: And therefore they that endeavour not, by all good means forcibly to hold in, and restrain this age, but give young men liberty, and suffer them to do after their own mind, plunge them ere they be aware into a licentious course of life, and all manner of wickednes. Wherefore good and wise Fathers, ought in this age especially, to be vigilant and watchful over their sons, they ought, I say, to keep them down, and to inure them to wisdom and vertue, by teaching, by threatning, by intreaty and prayers, by advice and remonstrances, by perswasion and counsel, by fair promises, by setting before their eyes the examples of some, who being abandoned to their pleasures and all sensuality, have fallen headlong into all calamities, and woful miseries: and contrariwise, of others, who by mastering their lusts and conquering their delights, have won honour and glorious renown: So surely, these be the two Elements and Foundations of Vertue; Hope of Reward, and Fear of Punishment, for as hope inciteth and setteth them forward, to enterprise the best and most commendable acts; so fear plucketh them back, that they dare not enter

upon lewd and wicked pranks. In ſumme, Fathers ought with great care to divert their Children from frequenting ill company, for otherwiſe, they ſhall be ſure to catch infection, and carry away the contagion of their lewdneſs. But we that profeſs our ſelves Chriſtians, are far enough from following this ſo good advice; ſuch of our Children indeed as are put forth to Trades, are many times under ſeverity enough, until they come out of their time, which is about three or four and twenty years of age; but as for thoſe that ſent are unto the Univerſity, the diſcipline is ſo ſlack, that they are almoſt at their own command, aſſoon as they come thither, and hence it comes to paſs many times, that they bring leſs learning with them from the Univerſity, than they carried to it.

And although the redreſſing of theſe inconveniences is not in my power, nay, for my ſaying thus much, I ſhall perhaps be ſharply cenſured; yet the inſtructing of Children in piety and good manners, as I am a Prieſt, according to the Church of *England*, and have taken upon me the charge of ſouls is certainly my duty; and to endeavour their further inſtruction in ſuch things, as may bring more comfort to them in their way of living, and more advantage to the Common-wealth, will not I hope be reputed a crime, though it will certainly prove a burden, but will withal, at leaſt, as I hope,

hope, give me opportunity of instilling into them, the principles of Piety towards God, Loyalty to their Prince, willing Submission to the Government of the Church, and of hearty love and affection to one another; for these things I bow my knees unto the Father of our Lord Jesus Christ, and I beg of others to joyn with me, in this good work, and candidly to accept, what I here propound for my Countries good.

Thine in the Lord,

John Nenton.

THE SCALE of INTEREST.

CHAP. I.

Of the Intereſt of Money, and the Conſtruction of Tables to that purpoſe.

IN the Proportions or Queſtions concerning the Intereſt of Money, there are four things to be conſidered, firſt the Principal, or Money lent for gain or Intereſt; Secondly, the time for which the ſaid Money is lent; Thirdly, the proportion which the Principal Money lent, hath to the ſum of that Principal, and the Gain or Intereſt added together; and fourthly, the gain or intereſt propounded.

The money to be lent may be more or leſs, as the borrower and the lender ſhall agree between themſelves; and although by Act of Parliament made in *Auguſt*, 1651. no perſon or perſons, may now take more than ſix pound for the uſe or forbearance of one

hundred pounds for a years time, yet that doth not confine men to lend or borrow for ſo long time, neither more nor leſs, no more then it doth confine the ſum to be lent or borrowed; but as we are at liberty to lend or borrow more or leſs, as our occaſions do require, ſo may the ſum whatever it be, be lent or borrowed for a longer or a ſhorter time than a year, the intent of that Act being only to reſtrain, or ſet down the rate of Intereſt which the lender may take by Law, and compel the borrower to give if he think fit; and that is *6 per cent. per annum.* And according to this rate, the Intereſt of money muſt be proportioned for any ſum, whether great or ſmall, for any time, whether more or leſs than a year. If therefore 100 *l.* ſhall be lent, or put forth for a years time, the borrower ſhall pay at the end of the year 106. and in this caſe the 100 *l.* is called the Principal, a year the time of forbearance, and the proportion which any other ſum of money, hath to the ſum of the Principal and Intereſt, is ſuch as 100 hath to 106, and the Intereſt it ſelf is ſix pound.

2. If then it were required to declare, how much muſt be paid for 50 *l.* at the years end, the anſwer will be 53 *l.* for as 100. 106. 50. 53. but if the Intereſt of 100 *l.* were required for ſix or three moneths time, there is ſomething more to be conſidered, before the anſwer can be rightly

rightly given; for although the Act doth limit the Intereſt of 100 *l.* for a year to be 6 *l.* and no more, yet it doth not ſay, that 3 *l.* ſhall be given for the Intereſt of 100 *l.* for half a year, or 30 ſhillings for three months time, nor will the common practice be a ſufficient proof, that that is the true and proportional Intereſt. When queſtions of Intereſt therefore are propounded ſomething more muſt ſtill be added, than is expreſſed in that Act of Parliament, namely, whether the Anſwer required muſt be given according to ſimple or compound Intereſt.

3. If the anſwer be required according to ſimple Intereſt, then the queſtion muſt be reſolved by proportion Arithmetical, and ſo there is no doubt but that 3 *l.* is the true proportional intereſt of 100 *l.* for ſix months time, and 30 ſhillings is the intereſt of 100 *l.* for three months, but then you muſt not reckon your months by 28 days to a month, nor yet by Calendar months, but ſix months time, is one half of 365 days, three months one fourth, one month a twelfth thereof. And becauſe the number of days in a year cannot be exactly halved, or equally divided by 4 or 12, ſome think it the better way to compute the Intereſt of Mony by the number of days, for which the Principal is lent when the time is leſs than a year. Of Simple Intereſt.

4. If the anſwer be required according to

Of Compound Interest.

to compound Interest, then the questio must be resolved by proportion Geometri cal, and so it is certain, that 3 *l.* is more tha the interest of 100 *l.* for 6 months, becau 100, 103, 106 are not proportional number for if they were, the rectangle figu made of the extreams, would be equ to the square of the mean by the 17 of th 6th, and 20 of the 7th of Euclide; but i these three numbers the rectangle mad of 100 and 106, the two extreams is b 10, 600; and the square of 103 the mea number is 10, 609. And hence it is appare that the true proportional increase of mon at any rate, and for any time propounde doth and must constitute a rank of cont nual mean proportionals, which rank o mean proportionals for time more than year, is made by the continual multiplica tion of the Principal and Interest by it sel and by the extraction of Roots for tim less.

5. The limited proportion for a year Interest is given, and therefore the yearl increase of money, for many entire year is easily known. As suppose 100 *l.* wer forborn or respited until the end of 4 years and you would know to what it will b augmented, at the rate of 6 *per cent. per annum* compound Interest; for answer hereunto you must create a rank of continual means

by

by the multiplying of 106 by it self for the second year, and that product by 106 for the third year, and the last product by 106 for the fourth year, so will the last product be the sum to which 100 will be augmented at the end of 4 years at *6 per cent. per annum* compound Interest, the like may be done for any other rate or time propounded.

But if the true proportional Interest, for 2 or 3 months be required, or for a shorter time, the answer is not so easily given, because Extracting of Roots is more troublesome than Multiplication, which is the only way of finding out continual means for time less than a year, and which to perform to the 12th (power as must be done, if the true proportional Interest for a month be required) is sufficiently laborious, but to the 365th power to find the interest for a day, nay to the 52d power, to find the interest for a weeks time, is by natural numbers scarce possible to be effected, but by Logarithmes very plain and easie, as I have already shewed in my *Trigonometria Britannica*, and by their help were all the prime numbers of all the ensuing Tables made. As the true proportional increase of 1 *l.* for 6 months at *6 per cent.* was found by the Table of Logarithmes ——— 1. 029563.

For 3 months ——— 1, 014673.

And for a days time ——— 1. 004867.

And hence by continual multiplication were

were made the Tables, ſhewing the increaſe of 1 *l.* for any time under 30 years, by years, halfs, and quarters, and in like manner the Table for days alſo, and according to the ſame rule, may Tables be made ſhewing the Intereſt or Increaſe of Mony at any other rate propounded.

Of Rebate of Diſcompt of Mony.

6. And as the increaſe of Mony is found by numbers in continual proportion increaſing; ſo is the Rebate or Diſcompt of Mony found by numbers in continual proportion decreaſing, Arithmetically or Geometrically, that is, at Simple or at Compound Intereſt. If 100 pound be due at the end of two years, and is to be ſatisfied by the payment of preſent Mony upon Rebate, after the rate 6 pound, *per centum per annum* Simple Intereſt, there ought to be ſo much ready mony paid, which in two years time, after the ſaid rate of Intereſt would be augmented unto 100 *l.* which may be done in this manner, 112 : 100 : : 106 : 89, 2857. and ſo for any other time propounded.

But if the ſame queſtion were to be anſwered at the rate of 6 *l. per centum per annum* Compound Intereſt, you muſt firſt find the preſent worth 100 pound for one year, in this manner; 106: 100 : : 100: 94, 3396. And by the continual multiplication of this number by it ſelf, will be created this rank of continual means 100. 94, 3396. 88, 9996.

83, 9619. the second whereof is the present worth of 100 *l.* due two years hence.

The same rank of continual means decreasing, may be also found from the Tables shewing the Increase of Mony in this manner;

1. As 106, 100 :: 100, 94, 3396.
2. As 112, 36, 100 :: 100, 88, 9996.
3. As 119, 101, 100 :: 100, 83, 9619.

Or having in this manner found the Rebate of 100 pound, or of one pound for the longest time you desire, that number so found being multiplyed continually by 106 : or 1, 06. will give you the Rebate of 100 pound, or of one pound for the several years decreasing.

Thus the present worth of one pound for 30 years being given, *viz.* 1, 74110. the rebate or present worth of one pound for 29. years is given also; for the number given 1, 74110 being multiplied by 1, 06 the product 1, 84556. is the rebate of one pound for 29 years, and this rebate being multiplyed by 1, 06, also the product 1, 95630 is the rebate of one pound for 28 years.

And in this manner having first found the rebate of one pound for 29 years $\frac{1}{4}$ 29 $\frac{1}{2}$ and 29 $\frac{3}{4}$ by the continual multiplication of these several numbers by 1, 06. was made the Table of Rebate of Mony at 6 *per cent.* for 30 years, halfs and quarters; and according to this example may other Tables be made for any other rate or time propounded.

And thus the nature of Simple and Compound

pound Interest being cleared, and the construction of Tables made easie; come we now to the use of the Tables here produced, and made from these assured Principles of Art and Reason. But first, I will here shew how the parts of a pound may be reduced into Decimals, and the contrary.

Chap. II.

Of the Reduction of the Parts of Mony into Decimals, and the contrary.

THe several numbers in these Tables, being either Decimal parts of a pound, or having Decimal parts annexed to the integers or whole pounds, before I shew the use of the Tables themselves, I will set down some brief rules, by which the several Denominators, or parts of a pound, may be reduced into Decimals, and the contrary. And this I will do first Arithmetically, and then by Tables.

The parts of a pound are Arithmetically to be reduced into a Decimal by the Rule of Three in this manner, set down the parts given, as vulgar Fractions are wont, then say,

As the Denominator of the Fraction given;

So to his Numerator.

So is the Denominator assumed;

To the Numerator or Decimal Fraction required.

Thus, if it were required to find the Decimal

ecimal fraction of 7 ſhillings, firſt I ſet it own as a vulgar fraction thus $\frac{7}{20}$, and this is alled ſeven twentieths of a pound. Then I ay;

As 20 the Denominator of the Fraction given:

Is to 7 the Numerator of the ſame Fraction:

So is 1: with Cyphers the common Denominator of all Decimals.

To the Decimal Fraction required.

And becauſe the Numerator being multiplied by 1, 10, 100, &c. the new Numerator aſſumed, is ſtill the ſame, therefore the Numerator given, being divided by the Denominator given, the quotient ſhall be the Decimal ſought.

And that the Diviſion may be continued to a convenient number of places, you muſt add cyphers to the Numerator given, thus to divide 7 by 20, that the Decimal may conſiſt of two places, I add two cyphers to 7, and they make 700, which being divided by 20, the quotient is 35, before which I ſet a point to ſign it for a Decimal, and ſo the fraction .35, or $\frac{35}{100}$ is equal to $\frac{7}{20}$.

2. Example. If it were required to find the Decimal of 5 pence, this ſet down in nature of a vulgar fraction, is $\frac{5}{12}$ of $\frac{1}{20}$, that is, five twelfths of one twentieth of a pound. But before it can be converted into a Decimal, this compound fraction muſt be

reduced into a ſingle fraction, and the w
of Reduction moſt obvious to vulgar cap
cities, and ſuch as are not acquainted wi
the nature of fractions, is to enumerate t
number of pence in twenty ſhillings, o
pound ſterling, and in 20 ſhillings the
are 240 pence, and therefore 5 pence
down in manner of a vulgar fraction, is 2
that is, a pound ſterling being divided in
240 parts, five pence are five of the
parts. Now then if you add 6 cyphers
5, and divide the whole 240, the quotie
will be .020833 the Decimal ſought.
like manner may the Decimal of a farthi
be alſo found, for if you divide 1. wi
cyphers annexed by 960, the number
farthings in a pound, the quotient .001041
will be the Decimal of a farthing r
quired.

There is yet another way by which t
Decimal fraction anſwering to the leaſt pa
of a pound, may be eaſily found, which
by continual halving the Decimal of tw
ſhillings, or tenth part of a pound, or inte
ger given, and two ſhillings being made th
integer, the Decimal is——1.000000
Hence the Decimal of one ſhilling is——0.500000
And the Decimal of 6 pence——0.250000
The Decimal of 3 pence——0.125000
The Decimal of three half pence——0.062500

Which

Which divided by 3, the Decimal of 2 farthings ——— } 0.0208333
The half whereof is the Decimal of a farthing ——— } 0.01041666

And the Decimal of a farthing being found by either of these ways, the Decimal answering to any other part of a pound, may readily enough be found by the Rule of three. In this manner, As one farthing is to his Decimal, so is any number of farthings to the Decimal sought, and thus if you multiply .01041666 the Decimal of a farthing by 32, the number of farthings in eight pence the product 03333312 is the decimal of 8 pence, as was required.

Or the Decimal of one farthing being found as before, the rest of the Table may be made by the continual addition of that Decimal unto it self, thus the Decimal of a farthing being .01041666, the Decimal of 2 farthings will be .0208333, the Decimal of 3 farthings .0312498, and so forward as high as you please.

And the Table of Reduction for every farthing in two shillings being thus made, the Decimal answering to any part of a pound may be easily found.

If the parts of a pound be shillings only, shillings being the tenth part of a pound, half the number of even shillings must needs be the Decimal answering to them; thus the Decimal of 8 shillings is 4, that is, 4

tenths of a pound, and thus 16 ſhillings b
ing 8 tenths of a pound, 8. muſt needs
the Decimal thereof.

But if the number of ſhillings be odd, ta
the leſſer half, and for the ſhillings rema
ing add 5, ſo have you the Decimal ſoug
Thus if it were required to find the Deci
of 15 ſhillings, the leſſer half is 7, to whi
I annex 5, and it makes, 75. the Decimal
15 ſhillings as was required; the Deci
anſwering to any other parts of a pou
under two ſhillings is given in the Tab
Thus the Decimal of one ſhilling five pe
farthing is .071875, and ſo for any oth

And to know what parts of a pound a
Decimal given doth repreſent, uſe this A
logie.

As the Denominator of the Deci
given.

Is to the Decimal fraction given.

So is the Denominator aſſumed.

To the new Numerator or parts of a pou
required.

Thus if it were required to find the pa
of a pound repreſented by this Deci
fraction, .071875. I ſay as 1000000
Denominator of the Decimal given, is
.071875: ſo is 20 the number of ſhilli
in a pound, To the number of ſhillings r
preſented by the Decimal given, which
this example is one ſhilling, and .4375 pa
of a ſhilling.

A

And to find the number of pence repreſented by .4357, the parts of a ſhilling. ſay,

As 10000.4875 : : 12. 5 pence, and 25 undred parts of a peny, and according to is analogy the farthings may be alſo found, ut having a Table of Reduction ready ade, this labour may be ſaved, for the rts of a pound anſwering to any Decimal ven, may be thereby as readily found, as e correſpondent Decimal to the parts of a ound propoſed.

As if it were required to find the parts a pound anſwering to this Decimal 71875, becauſe the Table extends but to two ſhillings, or one tenth of a pound, d that the Decimal given is more than ne tenths, I double 9 the firſt figure there- towards the left hand, and it maketh 18: e reſt of the Decimal given repreſents e ſhilling five pence farthing; the like ay be done for any other, and that with much eaſe that I think it neeedleſs to ouble the Reader with more examples.

Chap. III.

Of the Increaſe and Rebate of Mony at Simple Intereſt.

HAving ſhewed the ground and fundamental rules by which Tables of Intereſt, and Rebate of Mony may be made for any time and rate propounded; it remaineth, that I now ſhew the form and uſe of the Tables here produced; and made according to theſe rules. And firſt, I will briefly ſhew the reſolution of Queſtions of Simple Intereſt.

2. The Intereſt or gain of 100 *l.* or any other Principle for one year, or any other time being known, the Intereſt of the ſame principal may be found for any time propounded, by one ſingle Rule of Three. Example, ſuppoſe 6 *l.* to be the Intereſt of 100 *l.* for a years time, or 365 dayes; the Intereſt of the ſaid 100 *l.* for 236 dayes may be found in this manner.

365 : 6 : : 236 : 3,87945.

Which being reduced is 3 *l.* 17 *s.* 7 *d.* near.

3. The Intereſt or gain of 100 *l.* principal mony for a year, or other time being given, the Intereſt of any other principal for the like time may be found, by one ſingle Rule of Three. Example. Suppoſe 6 *l.* to be the Intereſt of 100 *l.* for a year and

and let the Intereſt of 258 be required:

100 *l.* 6 : : 258. 15 *l.* 48, that is, being reduced: 15 *l.* 9 *s.* 7 *d.* $\frac{1}{4}$ *ferè.*

4. And hence it is apparent, that the Intereſt of 100 *l.* being known for a years time, or 365 dayes, the Intereſt of any other principal may be found, for any number of dayes whatſoever; by two ſingle Rules of Three. Thus if it were demanded, what the Intereſt of 400 *l.* is for a week, or 7 dayes at the rate of 6 *per cent. per annum* the anſwer will be .46027. *i. e.* 9 *s.* 2 *d.* near.

1. 100. 6 : : 400. 24.

2. 365. 24 : : 7. 46027.

But if inſtead of the Intereſt of 100 *l.* for a year, you take the Intereſt of one pound for a day in Decimals, the Intereſt of any other Principal, may be more eaſily found, and with no leſs exactneſs. Example. The intereſt of one pound for a day at 6 *per cent. per annum*, is .000164383, or very near. Now if the Intereſt of 1000 for 131 dayes were acquired. Multiply the Decimal given firſt by the 1000 *l.* propounded, and then by the number of dayes, for which the Intereſt is required, the laſt product will give the anſwer required. Thus .000164383 being multiplied by 1000 *l.*, the product is 000164383000, from which cutting off 9 figures, the number of places in the Decimal given, the Intereſt of 1000 *l.* for one day

will be 164383000, which being multiplied by 131, the number of dayes for which the Intereſt is required, the product will be 21534173000, from which cutting off 9 figures, as before the anſwer is 21,534173, that is 21 *l.* 10 *s.* 8 *d.*

5. As for the Increaſe of Annuities at Simple Intereſt it is not much uſed, but yet I will add one example of that alſo.

If an Annuity, or yearly rent of 134 *l.* 10 *s.* 6 *d.* be all forborn till the end of 4 years, what will it then amount unto. Simple Intereſt being allowed at the rate of 6 *per centum per annum*, for each years rent from the time on which it is due, until the end of the ſaid term of 4 years? Anſwer.

It is evident by the queſtion, that at the rate of Intereſt aſſigned, there muſt be computed the Intereſt of 134 *l.* 10 *s.* 6 *d.* (due at the third years end for one year, to wit the fourth year; alſo the Intereſt of the like ſum due at the ſecond years end, for two years, to wit, the third and fourth year; alſo the Intereſt of the like ſum due at the firſt years end for three years, to wit, the 2. 3. and 4. years, all which Intereſt Monys being added to the ſum of the four years rent the Aggregate will ſhew what the ſaid Annuity will amount unto at the end of the fourth year.

The Intereſt of 134 *l.* 10 *s.* 6 *d.* at the rate of 6 *l. per centum per annum*,

For one years is —— 8. 0715
For two years —— 16. 1430
For three years —— 24. 2145
The ſum of the 4 years rent —— 538. 1000

The total ſum, *viz.* —— 586. 5290
Is the Anſwer required, *viz.* 586*l.* 10*s.* 7*d.*

6. Rebate or Diſcount of Mony at Simple Intereſt, is to be found by one ſingle Rule of Three, or by two at the moſt; if the Intereſt of any ſum of mony be already known, it may be found by one ſingle Rule of Three, as if it were demanded, what 100*l.* due a twelve month hence is worth in ready mony at 6 *per centum per annum* Simple Intereſt. I ſay,

106. 100 :: 100. 94,3396.

That is to ſay, as 106 Principal and Intereſt proceeds from 100 *l.* Principal forborn for a year: ſo 100*l.* Principal and Intereſt proceeds from 94,3396 preſent mony in a years time.

But if the preſent worth of a ſum of mony due at ſome time to come, for which the Intereſt of another ſum of mony is not known, then you muſt firſt find the Intereſt of the other ſum, for the time propounded, before you can find out the preſent worth of the ſum in the queſtion, as if the preſent worth of 150*l.* 10*s.* due 73 dayes hence were required, becauſe I know not readily what the Intereſt of 100*l.* or other ſum

is

is for 73 dayes, I first compute that in this manner,

365. 6*l*:: 73. 1 *l*. 2. and then I say

101 *l*. 2. 100 *l*:: 150 *l*. 5. 148,7154.

which being reduced, is 148 *l*. 14 *s*. 3 $\frac{1}{2}$ very near.

7. How the present worth of Annuities may be computed at Simple Interest, will be fully enough declared by one example. Which let be this, What is 100 *l*. *per annum* for 5 years to come, worth in ready money, rebate or discompt being made at 6 *per cent*. Simple Interest.

It is manifest that there must be computed the present worth of 100 *l*. due at the first years end, also the present worth of 100 *l*. due at the second years end, and for 3, 4 and 5 years, all which particular present worths being added together, the sum will be the present worth of that Annuity.

The Operation by Decimals is as followeth,

		l.
1.	106 : 100 :: 100 :	94,33962
2.	112 : 100 :: 100 :	89,28571
3.	118 : 100 :: 100 :	84,74576
4.	124 : 100 :: 100 :	80,64516
5.	130 : 100 :: 100 :	76,92307
The present worth is		425,93932

And in this manner might Tables be made to shew the present worth of one pound for any number of years, as also for months or dayes;

dayes; and by that Table another may be made to shew the present worth of Annuities also. The making of the first hath been already shewed, the latter is thus;

The first in the second Table is the same with the other; the second in the latter is composed of the second in the first, and the first in the latter; the third in the latter is composed of the third in the first, and the second in the latter; the fourth in the latter is composed of the fourth in the former, and third in the latter, *&c.*

1. Table.

A Table shewing the Decimal parts of a pound, the present worth of one pound, due at the end of any number of years to come, not exceeding 7 years at the rate of 6 per cent. per an. *Simple Interest.*

1	.943396
2	.892857
3	.847457
4	.806451
5	.769230
6	.735294
7	.704225

2. Table.

A Table shewing in Pounds and Decimal parts of a pound, the present worth of an Annuity, to continue any number of years, not exceeding 7 at the rate of 6 per cent. per annum *Simple Interest.*

1	0.943396
2	1.836253
3	2.683710
4	3.490162
5	4.259393
6	4.994687
7	5.698912

To

To explain the uſe of theſe Tables, an example in each will be ſufficient.

An Example of the firſt Table.

If 356 pound be payable at the end of five years to come, what is it worth in ready mony, rebate being made at 6 *per cent.* Simple Intereſt.

In the firſt Table right againſt 5 years, I find this number .769230, which ſhews that one pound due at the end of 5 years to come is worth in preſent mony .769230 decimal parts of a pound. Therefore

1. 769230 : : 356. 273,845880.

An Example of the ſecond Table.

What is the preſent worth of an Annuity or rent of 100 *l. per annum*, payable yearly for 5 years, at 6 *per cent. per an.* Simple Intereſt.

In the ſecond Table, right againſt 5 years, I find this number 4,259393, which is the preſent worth of one pound Annuity to continue 5 years, Rebate being made at 6 *per centum per ann.* Simple Intereſt. Therefore

1. 4,259393 : : 100. 425, 9393.

Which operation being compared with the former reſolution of the ſame queſtion, the great benefit of Tables of this kind will be apparent.

CHAP.

Chap: IV.

Of the Increaſe and Rebate of Mony at Compound Intereſt.

WHat I have ſaid in the former Chapter, I judge ſufficient for the reſolution of all Queſtions concerning the Increaſe and Rebate of mony or Annuities at Simple Intereſt, and now I am to ſhew the uſe of the Tables here produced, as well of Compound as of Simple Intereſt. And becauſe the year which doth conſiſt of 365 dayes, cannot be equally divided into halfs, or quarters, and ſuch other proportions of time, for which the Increaſe and Rebate of Mony is required, to prevent the miſtakes, to which our Scriveners are too often liable in the dating of their Bonds, I have here compoſed a Table ſhewing the Increaſe and Rebate of mony at *6 per cent.* at Simple and Compound Intereſt, both for every day in the year, and that in the form of your uſual Almanacks or Kalenders, with ſuch other Tables and Directions, as may make it generally uſeful and perpetual.

One uſe then for which this Kalender was intended, beſides the ſhewing the Increaſe and Rebate of mony, is as hath been ſaid, for the more exact and ready dating of Bonds, without prejudice to the borrower

or

To explain the uſe of theſe Tables, an example in each will be ſufficient.

An Example of the firſt Table.

If 356 pound be payable at the end of five years to come, what is it worth in ready mony, rebate being made at 6 *per cent.* Simple Intereſt.

In the firſt Table right againſt 5 years, I find this number .769230, which ſhews that one pound due at the end of 5 years to come is worth in preſent mony .769230 decimal parts of a pound. Therefore

1. 769230 : : 356. 273,845880.

An Example of the ſecond Table.

What is the preſent worth of an Annuity or rent of 100 *l. per annum*, payable yearly for 5 years, at 6 *per cent. per an.* Simple Intereſt.

In the ſecond Table, right againſt 5 years, I find this number 4,259393, which is the preſent worth of one pound Annuity to continue 5 years, Rebate being made at 6 *per centum per ann.* Simple Intereſt. Therefore

1. 4,259393 : : 100. 425, 9393.

Which operation being compared with the former reſolution of the ſame queſtion, the great benefit of Tables of this kind will be apparent.

CHAP.

Chap: IV.

Of the Increaſe and Rebate of Mony at Compound Intereſt.

WHat I have ſaid in the former Chapter, I judge ſufficient for the reſolution of all Queſtions concerning the Increaſe and Rebate of mony or Annuities at Simple Intereſt, and now I am to ſhew the uſe of the Tables here produced, as well of Compound as of Simple Intereſt. And becauſe the year which doth conſiſt of 365 dayes, cannot be equally divided into halfs, or quarters, and ſuch other proportions of time, for which the Increaſe and Rebate of Mony is required, to prevent the miſtakes, to which our Scriveners are too often liable in the dating of their Bonds, I have here compoſed a Table ſhewing the Increaſe and Rebate of mony at *6 per cent.* at Simple and Compound Intereſt, both for every day in the year, and that in the form of your uſual Almanacks or Kalenders, with ſuch other Tables and Directions, as may make it generally uſeful and perpetual.

One uſe then for which this Kalender was intended, beſides the ſhewing the Increaſe and Rebate of mony, is as hath been ſaid, for the more exact and ready dating of Bonds, without prejudice to the borrower

or

or the lender; which if they deſire to do, they muſt not reckon their months by weeks, allowing four times 7 dayes, or 28 dayes to a month, for ſo they will make 13 months to the year; but they ſhould allow for one months time, or 12th part of a year 31 dayes, for 2 months 61, and 92 dayes for 3 months time, 183 dayes, for half a year, and 274 for 9 months.

And to know from any fixed day given, when any of theſe terms will be expired, this or the like Table will aſſiſt you. As if a Bond were dated the 29th of *March*, and it were deſired to know, upon what day the 6 months will be ended, there being 183 dayes to be reckoned to the 6 months, I add 183 to 88, the number of dayes from the 1. of *January* to the 29 of *March*, and they make 271, which being ſought in the Kalender, will be found right againſt the 28. of *September*, which is the day or time required.

Or if you would know how many dayes there are from the 12. of *October* to the 5. of *March*; firſt find the number of dayes from the 12. of *October* to the end of *December*, by ſubſtracting 285, the number of dayes againſt the 12. of *October*, from 365, the number of dayes in a year, the remainer which is 80, add to 64 the number of dayes againſt the 5. of *March*, their ſum which is 144 is the number of dayes required,

and

and thus may you do with any other question of the like nature.

Next to the Kalender or Table, shewing the increase and rebate of mony for dayes, you have a Table shewing the increase and rebate of mony for 30 years, by years, halfs, and quarters, at *6 per centum per annum* compleat Interest. The use of all which several Tables shall be explained in the questions following.

Of the Increase of Mony.

1. *Quest.* If 8 pound be forborn for 53 dayes, to what sum will it be augmented in that time at *6 per cent. per ann.* Compound Interest. In the Kalender or Table shewing the increase or rebate of mony, right against 53 dayes under the title, *Increase of Money*, I find this number, 1.00849 which is the increase of 1 *l.* for that time; therefore.

1. 1,00849 :: 8. 8,06792.

which being reduced is 8 *l.* 01 *s.* 3½.

2. *Question*, If 235 pounds be forborn or put forth for 73 days at *6 per cent. per ann.* Compound Interest. To what sum will it be augmented in that time.

In the Kalender or Table shewing the increase and rebate of mony for dayes right against 73 dayes under the title, *Increase of Money*, I find this number, 1.01172. which is the increase of 1 *l.* for that time; therefore. 1. 1,

1. 1,01172 :: 235. 235,75420.
which being reduced, is, 235 *l.* 15 *s.* 1 *d.*

3. *Question.* If 27 pound, 12 ſhillings and 6 pence be forborn for 7 years and a quarter, to what ſum will it then amount, at the rate of 6 *per cent. per an.* compound Intereſt.

Becauſe the ſum of money in the queſtion hath a fraction part of a pound annexed to it, the ſaid fraction, *viz.* 12*s.* 6*d.* muſt be converted into a Decimal, and the Decimal of 12*s.* is 6. the Decimal of 6 *d.* is 025. and therefore the ſum of money given, to gether with the decimal fraction, 27. 625. And in the Table ſhewing the increaſe of money for years, halves, and quarters, right againſt 7 years and a quarter, I finde this number 1.525694. which is the increaſe of one pound for that time: therefore

1. 1,525694 :: 27,625. 42,14729475.
which being reduced, is 42*l.* 2*s.* 11*d.*

Of the rebate or diſcompt of Money.

5 *Queſtion.* If 235 pounds be due 125 dayes hence, what is it worth in ready money, diſcompt being made at 6 *per cent.* compound Intereſt.

In the Kalender, or Table, ſhewing the increaſe and rebate of money, right against 125 dayes, under the title, *Rebate of money*, find this number .983430. which is the preſent worth of one pound, due at the end

of 125 dayes to come. Therefore

1;983430 : : 235;231,106050.

6. *Question*, If 215 pounds be due at the end of 7 years, and a quarter to come, what is it worth in present mony, discompt being made at 6 *per centum per annum*; Compound Interest?

In the Table shewing the Rebate of mony for years, halfs, and quarters, right against 7 years and a quarter I find this number, 6554393 which is the present worth of one pound due at the end of 7 years and a quarter to come, therefore;

1;6554393 : : 215; 140,9194495.

CHAP. V.

Of the Increase of Annuities at Compound Interest.

FRom the Tables shewing the Increase and Rebate of Mony, Tables shewing the Increase, Rebate, and Purchase of Annuities may be easily made; whether the Annuity shall grow due by yearly, half yearly, or by quarterly payments, and first I will shew how Tables may be made, for the easie and speedy finding of the increase of Annuities.

Evident enough it is to every mans apprehension that if there be computed, what

an Annuity due at the years end will amount unto, being put forth at a certain rate of Compound Intereſt, for the remainder of that term for which the Annuity is to continue, and alſo what the like ſum or annuitie due at the ſecond years end will be augmented to in the following years, and ſo the third, and all the reſpective annuities which follow, and their ſum added to the laſt years rent, the total muſt needs make the ſum, to which the Arrears will amount in that time.

As ſuppoſe there were an Annuity of one pound to continue for 4 years: one pound the firſt years rent being put forth at *6 per cent.* Compound Intereſt will be augmented.

In the 3 following years unto—	1. 191016
The 2 years rent for 2 years—	1. 123600
The 3 years rent for 1 year—	1. 060000
To all which the laſt years rent added—	1.

Their total is the ſum in Arrear. 4. 374616.

So that the finding to what ſum an Annuity forborn any number of years will amount unto, at the end of the term at any rate propounded, is nothing elſe, but the finding of the ſum of all the terms in a Geometrical Progreſſion, which to effect, I will here ſhew two wayes.

Firſt by a Continual Addition of the mean proportionals, and thus the firſt number in this Table of Annuities muſt be 1, or unitie; the

the second number is composed of 1 or unitie, and the number shewing the increase of 1 *l.* for a year; the third number is composed of 1. and the sum of the first and second years increase, and in that order the rest are found; or thus, the third number is composed of the second year in the Table of Interest, and the second in this Table of Annuities; the fourth number is composed of the third years increase in the Table of Interest, and the third number in this Table of Annuities, *&c.*

In like manner, a Table shewing the Increase of Annuities by half yearly payment must be made by the addition of the half yearly increase of money: And a Table shewing the Increase of Annuities by quarterly payment, must be made by the Addition of the quarterly increase of mony, as by the Tables themselves doth plainly appear, but here you are to observe, that according to either of these wayes of composing the Table by Addition, the numbers in the Tables shewing the increase of mony, ought to be continued to more places than are there expressed, to prevent errour, which will otherwise happen in the adding of defective numbers.

A second way to find the sum of all the terms in a Geometrical Progression is this.

Let α be the first, β the second, ω the

laſt, and Z the ſum of all the terms, I ſay then

$$\frac{\beta\omega - aq}{\beta - a} = Z \text{ or } \frac{\beta\omega - 1}{\beta - 1} = Z$$

That is, from the Rectangle of the ſecond and laſt term, deduct the ſquare of the firſt, and the remainder divide by the ſecond, leſs by the firſt; the quotient ſhall be the ſum of all the terms in that progreſſion.

Hence ariſeth a general Theorem whereby to find the increaſe of Annuities for any time or rate propounded two wayes.

Theorem. $\beta - 1. \beta\omega - 1 :: P. A^{\flat}$ that is,

As the Rate leſs by the Principal.

Is to the Intereſt of that Principal.

So is *P.* the penſion given.

To $A^{\flat}$ the amount or Increaſe of that Penſion.

And therefore a Table ſhewing the increaſe of mony, being computed, we may by that Table find the Increaſe of Annuities alſo.

For firſt, the Rate leſs by the Principal, as in the Table of *6 per cent.* the rate or proportion between 1. 06, and 1,1236, is 1.06 from which deducting one pound, the principal, the remainder .06 is the intereſt of one pound for a year; and the intereſt of 1 for any number of years within the Table, eaſily found; ſuppoſe 15, the Table ſhewes that one pound in that time will be augmente

mented unto 2, 39655. from which if you deduct 1 *l.* the principal, the remainder 1, 39655 is the intereſt or increaſe that is made thereof in that time.

Now then by this Rule I ſay;

As the Rate leſs by the Principal—. 06.
Is to the Intereſt thereof for 15 y. 1,39655
So is the Annuity propounded —1.
To the increaſe thereof———23,27596
as by the Table for the increaſe of Annuities it doth appear.

Another way.

By the way of working already ſhewed, one pound which in our Tables is the ſuppoſed Principal, muſt be deducted from the increaſe of one pound, for the time in the Queſtion.

And obſerving from this Theorem, that the increaſe of Annuities is nothing but the intereſt or increaſe of a certain ſum for many years, of which the Annuity propounded is the intereſt.

It is manifeſt, That if you firſt find the principal whereof the Annuity given is the intereſt, and then by the Tables ſhewing the increaſe of mony, find alſo the ſum to which that principal will be augmented in the given time, the principal being deducted from that ſum, ſhall leave the intereſt of that principal, or increaſe of that Annuity.

Any Annuity therefore being given, to find the increaſe thereof, proceed in this manner. And ſay;

As the Rate of Intereſt propounded;
Is to the Principal of that Intereſt.
So is the Annuity given;
To his Correſpondent Principal required.

Then find the ſum to which that Principal will be augmented for the time propounded, as hath been ſhewed, and from that ſum deduct the Principal found, what remaineth is the Increaſe of that Annuity.

Example 1. let one pound be the Annuity propounded, and let the Increaſe of this Annuity in 15 years, at the rate of 6 *per cent.* be ſought.

Firſt I ſay, As 06; 1 : : 1; 16, 66666.

And to find the ſum to which this principal, 16, 66666. will be augmented in 15 years time at 6 *per cent.* I turn to the Table ſhewing the increaſe of mony, and right againſt 15 years I find the increaſe of 1 *l.* to be 2, 39655. therefore;

As 1; 2, 39655 : : 16. 66666; 39, 94262.

Now then deducting 16, 66666, from 39, 94262. the remainer 23, 27596 is the ſum to which an Annuity of 1 *l. per annum* will be augmented in 15 years, as by the Table doth appear.

2. Example. Let 23 *l.* be the Annuity given,

and

and let the increase of this Annuity for 20 years time be sought. First I say,

As 06; 1 : : 23 ; 383,33333.

And to find the sum to which 383,33333. will be augmented in 20 years, I turn to the Table, shewing the increase of mony for years, halfs and quarters at *6 per cent.* and right against 20 years, I find the increase of one pound to be 3,20713. Therefore

As 1;3,20713 : : 383,33333;1229,40190

Now then deducting 383,33333. from the remainer 846.06857 is the sum to which an Annuity of 23*l.* will be augmented in that time; which by the Table shewing the increase of Annuities may thus appear.

As 1;36,78519 : : 23 ; 846,06857.

In like manner may the increase of any other Annuity be also found, growing due by half yearly or by quarterly payments.

Chap. VI.

Of the Rebate or present worth of Annuities.

The Rebate or present worth of Annuities may be found much after the same manner, by which we found increase; for as the increase of an Annuity is the sum of the terms in a Geometrical Progression increasing above unity; so is the present

worth of an Annuity, the sum of the terms in Progression Geometrical decrease beneath unitie. For it is evident, that if the present worth of an Annuity due at the first years end, be computed with the present worth of that Annuity due at the second years, and so the third, and all the respective Annuities which follow to the end of the term; the sum of all these present worths, must needs be the present worth of that Annuity.

As suppose there were an Annuity of one pound to continue for 4 years, the present worth of the first years annuity being computed at 6 *per centum* will be found to be ——— .94339

The present worth of the second years Rent ——— .88999

The present worth of the third years Rent ——— .83961

The present worth of the fourth years Rent ——— .79209

The sum of all which present worths ——— 3.46510

is the present worth of one pound annuity to continue for 4 years.

And in this progression one pound is properly the first term, 792093 the last; 1. the common rate: but because the last term in this progression is the least, we must by supposition make it the first, & then .94339 the first that is set down in this progression being

being the greatest, will become the last; which being multiplied by 1, 06 the common rate, will become an unite.

And therefore $\beta\omega - A = 1 - A$: last term, .943396 multiplied by 1. 06 the rate, less by .792093 the first term, is equal to $1 - A$: that is to one, less by .792093: and $\beta\omega - A$ or $1 - A$ being divided by $\beta - 1$, the quotient will be equal to Z the sum of the terms as was said before.

Hence ariseth a General Theorem, whereby to find the present worth of Annuities, at any rate propounded, two ways.

Theorem, $\beta - 1 . \beta\omega - A :: P . W$.

Or thus $\beta - 1 . 1 - A :: P . W$.

In words thus.

As the Rate less by the Principal.

Is to that Principal less the present worth.

So is P the Pension given.

To W. the present worth of that Pension.

And therefore a Table shewing the present worth of mony being computed; the present worth of annuities may be found by it; for as in the increase of mony, so in the rebate or present worth.

The rate less by the Principal is the Interest of that Principal, and the Principal less by the present worth, is the rebate or difference between the Principal and the present worth, for any time propounded.

Thus in the Table computed to shew the present

present worth of mony at *6 per cent.* 06 is the rate less by the Principal as before, and the present worth of one pound the principal for 20 years is .311804 which being deducted from 1 *l.* the difference is .688196 and then is the rebate of 1 *l.* Principal, and the present worth of the Annuity. 06 for 20 years. Now to find the present worth of 1 *l.* annuity. I say.

As the rate less by the principal-06
Is 1. *l.* the present worth——.688196
So is one pound annuity——1.
To the present worth thereof—11,46993
as by the Table shewing the present worth of annuities it doth appear.

Another way.

The second term in this proportion being the present worth of that annuity expressed in the first term, and found by deducting the present worth of the principal of that annuity from 1 *l.* the principal of 06. it is manifest, that if the correspondent principal to any annuity be found, as hath been already shewed, with the present worth of that principal for any time propounded, that present worth being substracted from the principal, the remainder shall be the present worth of an annuity equal to the interest of that principal, and therefore to Answer this Question otherwise: I say;

If .06 give 1 *l.* 1 *l.* shall give 16,66666.

s before. And to find the preſent worth of his Principal not due till 20 years. I turn to the Table ſhewing the preſent worth of mony by years, halfs, and quarters, and right against 15 years, I find the preſent worth of one pound to be .311804. Therefore

As 1. to 311804: : 16,6666 to 5,1967. which being ſubſtracted from the Principal 16,6666, the remainder 11,4699 is the preſent worth of that Annuity as before.

2. Example. If an Annuity of 16 *per annum* for 5 years paid quarterly were to be ſold, What is the worth thereof in ready mony, at 6 *per centum per annum* Compound Intereſt?

The Intereſt of 1 *l.* for 3 months at 6 *per cent.* is .014673 hence to find the correſpondent Principal of 4 pound: I ſay

As .014673; 1: : 4; 272,726095.

And the preſent worth of 272,726095 due 5 years hence, is 203,70966, which being deducted from 272,6095 the Principal before found, the remainder 68,89989 is the preſent worth of 16 *per annum* for 5 years at 6 *per centum*, the Rent or Penſion being paid by 4 pound every quarter. The like may be done for any other rate or time propounded.

And yet it muſt be acknowledged, that the preſent worth of Annuities may be more eaſily found, by ſuch Tables as are purpoſely made for it. Such Tables therefore we have

have alſo added, for the ſeveral rates of 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 *l. per centum*, the Annuities growing due by yearly payments, the which Tables were made, from Tables ſhewing the preſent worth of mony, in the ſame manner, that the Table ſhewing the Increaſe of Annuities were made, from the Table ſhewing the increaſe of mony; and the uſe of theſe Tables will be ſufficiently explained by the example following.

Queſt. If an Annuity of 45 *l. per annum* to continue 27 years, were to be ſold, what is the preſent worth thereof, at 6 *per cent. per an.* Compound Intereſt, the Annuity growing due by yearly payments?

In the Table ſhewing the preſent worth of Annuities for ſeveral rates, in the column of 6 *per. cent.* I ſeek the preſent worth of 1 *l.* Annuity for 27 years, which I find to be 13, 21053. Therefore

As 1 l. to 13, 21053.

So 45 *l.* to 588, 47397.

The Queſtions hitherto propounded, are ſuch as exceed not the term expreſſed in the Tables, and ſo theſe Tables may ſeem to be of no uſe; for any time not there expreſſed, I will therefore give an Example in the preſent worth of an Annuity for a time not expreſſed in theſe Tables.

Queſt. If an Annuity of 27 *l. per annum* for

53 years were to be ſold, what is it worth in preſent mony, at *6 per centum per annum* Compound Intereſt?

To reſolve this Queſtion, you muſt firſt compute the preſent worth of 1 *l.* not due till 53 years hence, and this you may do by any numbers in the Tables whoſe correſpondent years do together make 53. as the numbers anſwering to 26 and 27 years, or thoſe anſwering to 23 and 30, the product made of the numbers anſwering to either of theſe two numbers of years, will be the preſent worth of 1 *l.* not due till 53 years hence.

The preſent worth of 1 *l.* due 26 years hence, is 2198100, due 27 years hence, is 2073679, and the product of theſe two numbers is .0455815. the preſent worth of 1 *l.* due 53 years hence.

Again, the preſent worth of 1 *l.* due 30 years hence, is. 1741101, due 23 years hence, is 2617972 the product of theſe two numbers, is 0455815, as before.

Hence to find the preſent worth of 27 *l.* Annuity, to continue 53 years, proceed as hath been ſhewed in the former examples: ſo will the correſpondent Principal of 27 *l.* be found to be 450 *l.* And the preſent worth of the ſaid Principal 450 *l.* will be found to be 20, 511675, which being deducted from 450 pound, the remainder 429, 488325 is the preſent worth

worth of 27 *l. per annum*, for 53 years 6 *per centum per annum* Compound Interest. The like may be done for any other.

Chap. VII.

Of the Purchase of Annuities.

And from these two Theorems, shewing the increase and present worth of Annuities, two other Theorems may be deduced, to shew the purchase of Annuities by present and by future payment, the first of these from the last Theorem, and the last from the first.

To find the present worth of Annuities, the proportion is $\beta - 1. - \beta^{\omega} - A :: P. W$ as hath been shewed in the last Chapter, and therefore $\beta^{\omega} - A. \beta - \ldots :: W^{\omega}. P.$ That is,

As the present worth of an Annuity, is to that Annuity; so is any other sum, to the Pension or Annuity sought.

And therefore to find Annuity 320 will purchase at 6 *per cent.* to begin presently, and to continue 7 years and a half, by half yearly payments, I make .029563 the interest of 1 *l.* for 6 months to be an annuity, whose present worth is found by substracting .6847182. the present worth of 1 *l.* for that time, from 1 *l.* Principal, for their difference *viz.* 3152818 is the present

preſent worth required. Therefore,

If the preſent worth given —— .3152818
Will purchaſe an Annuity of —— .0295630
The preſent mony given —— .320.
Will purchaſe an Annuity of 30 *l. per ann.*

This is the rule to find what Annuity a ſum of mony paid down preſently will purchaſe, But ſuppoſe, that *A* by Will, bequeaths unto *B* 250*l.* to be paid 5 years and 3 months after, and *C* the Executor to accommodate *B* for his preſent maintenance is willing to grant him an Annuity for 5 years 3 months, and ſo diſcharge himſelf of the Legacy of 250*l.* given to *B.* the Queſtion is what Annuity to begin preſently at 6 *per cent.* is equivalent to the ſaid 250*l.* not due till 5 years 3 months hence.

To find the increaſe of Annuities the proportion as hath been ſhewed in the 5 Chapter, is

$\beta - 1. \beta^{\omega} - A :: P. A^{\omega}$. And therefore alſo.
$\beta^{\omega} - A. \beta - 1 :: A^{\omega}. P.$ That is.

As the Increaſe of an Annuity, is to that Annuity.

So is the ſum of mony given, which by ſuppoſition is made the increaſe of another Annuity.

To the annuity ſought.

And making .014673 the intereſt of 1*l.* for 3 months to be an annuity, the increaſe thereof is found by deducting 1*l.* the principal from 1,357862 for 5 years and 3 months

months, the remainder .357862 is the ſum to which the quarterly annuity of .014673 will be augmented in that time. Hence to find what annuity in preſent 250 *l.* will purchaſe, not due till the end of the term I ſay:

As the increaſe of the annuity given ——— } .357862
Is to the ſaid annuity ——— .014673
So is the ſum of mony given ——— 250.
To the annuity ſought ——— 10. 251031

All Queſtions concerning the purchaſe of annuities by yearly payment with preſent mony may be reſolved by the Table ſhewing the preſent worth of annuities, for 10 ſeveral Rates of Intereſt, according to the examples already given.

But of that Table there is another uſe for which it is cheifly intended, to wit; The price of an annuity being given, to find the rate of Intereſt, which is allowed for the mony. An example whereof doth follow.

Queſt. If an annuity of 45 *l. per annum* to continue 15 years, were to be ſold for 350 *l.* What is the rate of Intereſt, which the purchaſer is allowed for his mony?

Firſt find how many years Purchaſe is demanded for the Rent propounded, by dividing 350 *l.* the purchaſe mony by 45 the annual rent, the quotient 7, 77778, or 7 years purchaſe 3 quarters, and ſomewhat more is the anſwer thereof.

The

Then in the Table ſhewing the preſent worth of Annuities at 10 ſeveral Rates of Intereſt.

A Leaſe for 15 years at 7 *l. per cent.* is, 8,06069 at 10 *per cent.* 7. 60608. the difference 45461.

The preſent worth given is——7,77778
The next leſs in the Table is——7,66608

The difference is——.17170

Now as.45461; 1::17170; —37768 which being deducted from 10 *per cent.* the remainder 9, 62232 or 9 *l.* 12 *s.* 5 *d.* ½ *ferè* is the rate of Intereſt, which the Purchaſer in that bargain is allowed for his mony.

And in this manner may Tables be computed for any other rate of Intereſt whatſoever, by help whereof, any Queſtions concerning the Increaſe or Rebate of Mony, and Annuities may be found eaſily and exactly: but to compute ſuch Tables for many ſeveral rates, is not only in it ſelf laborious, but would ſwell this Book too much beyond the intended bulk, and all to little or no purpoſe; ſince the reſolution of all Queſtions concerning Anatociſm, or Compound Intereſt, may be yet more eaſily performed by the Table of Logarithmes, as ſhall be ſhewed in the Second Part of this Diſcourſe.

The End of the Firſt Part.

THE SCALE OF INTEREST.

The Second Part.

OR

The Joynt uſe of *Decimal Fractions*, and the Table of *Logaritbmes* in the eaſie and exact Reſolving of all Queſtions in Anatociſm or Compound Intereſt, as in the Increaſe and Rebate of Mony and Annuities.

TOGETHER

With their uſe in the meaſuring of Board, Timber, Stone, and ſuch like, very neceſſary for all Carpenters, Joynners, Maſons, and indeed, for all Tradeſmen whatſoever.

London, Printed in the Year 1667.

THE SCALE of INTEREST.

The Second Part.

CHAP. I.

The Definition of Logarithmes.

HAving in the first Part of this Treatise, shewed the Construction and use of Decimal Tables in Anatocism or Compound Interest, by Multiplication and Division, according to the Rules of Natural Arithmetick; I shall now shew, how all the questions concerning the Increase and Rebate of Mony and Annuities, may be resolved by the Rules of Arithmetick artificial, or borrowed numbers called Logarithmes.

2. Logarithmes are borrowed numbers,

which being adjoyned to numbers continually proportional, have equal differences among themſelves.

Any numbers being given, divers other numbers may be annexed unto them, which may well enough agree with the general Definition of Logarithmes, and alſo afford ſome acceptable uſe. As if the numbers continually proportional were 1. 2. 4. 8. 16. 32. 64. 128. The numbers aſſigned to them for Logarithmes, may either be theſe in the column ſigned with *B.* or *C.* or *D.* as here you ſee them. Or others, ſo that this one thing be but obſerved. That the differences of the Logarithmes, whether increaſing or decreaſing be alwayes equal, as *A*, as the numbers to which they are annexed be proportional. So that Logarithmes may not unfitly be called Æquidifferent Companions of proportional numbers. Which by the Honourable Inventer, do therefore ſeem to be called Logarithmes, becauſe they exhibit ſuch numbers to us as alwayes keep the ſame proportion among themſelves.

	A	B	C	D
1	1	5	5	35
2	2	6	8	32
4	3	7	11	29
8	4	8	14	26
16	5	9	17	23
32	6	10	20	20
64	7	11	23	17
128	8	12	26	14
256	9	13	29	11
512	10	14	32	8
1024	11	15	35	5
2048	12	16	38	2

And that we may the better understand the nature and affections of these Logarithmes, there are some Lemmas to be considered.

1. *Lemma.*

In any rank of numbers, equally increasing or decreasing, their differences are proportional to the number of the intervals, or spaces between those differences:

As in the rank of numbers signed with D, let there be taken the first, third, & the eight, 35, 29, 14, between the first and third there are two spaces, between the third and eight there are five spaces. I say that 6 the difference of the first and third, hath such pro-

portion to the difference of the third and eight, as two hath unto five.

Therefore in a rank of numbers continually proportional, the Logarithmes of any two of them being given, we may find the Logarithme of any other of thoſe numbers whatſoever; for there is given the interval of theſe numbers between themſelves and of the third, from either of them, and there is alſo given the difference of the Logarithmes given. Two intervals therefore being given, and the difference of the given Logarithmes, there may be found the other proportional difference between the Logarithme given and enquired.

For example, Let the proportional numbers be: 4 : 6 : 9 : 13,5 : 20,25 : 30,375, and let the Logarithmes of the firſt and third be given, namely, 060206, and 095424, their difference is 035218, and let the Logarithme of the ſixt number, to wit, 30,375 be ſought. The intervals given between the firſt and third, are two; the third and ſixt, three: The difference of the Logarithmes 035218, the fourth proportional number ſought 052827 is the difference of the Logarithmes inquired, which being added to the given Logarithme of the third number, giveth 148251, the Logarithme of the ſixt number inquired, as here you ſee.

4	7	0,60206	035218	Differ.
6				data.
9	11	0,95424		
13,5			052827	Differ.
20,25				quæsit.
30,375	17	1,48251		

Proportion.
23 : : 035218. 052827.

2. *Lemma.*

If of four numbers the first exceeds the second, as much as the third exceeds the fourth; the sum of the first and fourth, shall be equal to the sum of the second and third, and the contrary. As 9, 5, 15, 11. The sum of the mean numbers, as well as of the extream, is 20. *Vide* 4. *Prop. lib.* 1. *Parismatum, Bacheti in Diophantum.*

And these two Lemmas, do sufficiently illustrate the chief affections of the Logarithmes in the general.

Chap: II.

Of the Logarithmes fittest for use.

ALthough we may in this manner frame several Logarithmes to the same proportional numbers, yet will it be most convenient to use one only kind, even

even that which hath a cypher for the Logarithme of an unite, becauſe that above all other is the moſt convenient, and moſt ready for all purpoſes; which being allowed, there are three Axiomes of great moment, that muſt of neceſſity follow.

1. That the Logarithmes of all numbers, are either thoſe numbers which are called *Indices*, and are wont by all Arithmeticians to be annexed to numbers continually proportional from unity, and ſhew their diſtance from unity: or thoſe which are proportional to theſe uſual *Indices*.

A	B	C	A	B	C
1	0	0000	1	0	0
10	1	1000	2	1	0,301030
100	2	2000	4	2	0,602060
1000	3	3000	8	3	0,903090
10000	4	4000	16	4	1,204120
100000	5	5000	32	5	1,505150
1000000	6	6000	64	6	1,806180

The numbers in the column A are numbers continually proportional from unity, in B the common *Indices*, in C Logarithmes proportional to thoſe *Indices*. Foraſmuch as the Logarithmes as well as the *Indices*, in numbers continually proportional from unity (to which only *Indices* are wont to be annexed)

annexed) equally increasing from the same beginning, according to the proportion of distance, are proportional to those very distances or intervals, they must also of necessity be proportional among themselves; as in the preceding numbers may be seen.

2. *Axioma.*

The Logarithme of the product, is equal to the sum of the Logarithmes of all the Factors. For as much as by the Rule of Multiplication; there is alwayes the same proportion between unity and the sum to be multiplied, as is between the Multiplicator and the Product, and it is apparent by the very definition of Logarithmes, that the Logarithmes of proportional numbers have equal differences: By the 2 Lemma it is clear, That the Logarithmes of the first and fourth, that is, of unity and the product, are equal to the Logarithmes of the second and third, that is of the Multiplicand and the Multiplicator; and seeing that the Logarithme of an unite is a cypher, it is manifest that the Logarithme of the product only, is equal to the Logarithmes of the Factors.

Factors	1.	0,000000
	3.	0,477121
	27.	1,431364
	81.	1,908485

If there be more Factors, the Logarithme of the Product, is equal to the Logarithmes

garithmes of them all. As if the Factors were, 2, 8, 64; the product by their continual multiplication, 1024. whose Logarithme 3,010300 is equal to the Logarithmes of those three, by whose multiplication this product is produced, as we may see.

A	2	0,301030
B	8	0,903089
C.	64	1,806179
D	1024	3,010300
E	16.	

For as much as the Logarithme of the number E 16, the product of A drawn into B, is equal to the Logarithmes of the numbers A and B, and that the Logarithme of the number D is for the same reason equal to the Logarithmes of the numbers E and C, the Logarithme of the number D must needs be equal to the Logarithmes of the number A, B, C, which was to be demonstrated.

3. Axiome.

The Logarithme of the Dividend is equal to the Logarithmes of the Divisor and Quotient. This doth necessarily follow from the precedent Axiome, because the product made of the Divisor drawn into the Quotient is the Dividend, and therefore, as an unite is to the Divisor, so is the Quotient to the Dividend.

Example

Example, let 128 be the dividend, 4 the Divisor, the Quotient shall be 32

		1	0,000000
Factors	Divisor	4	0,602060
	Quotient	32	1,505150
Product.	Dividend.	128	2,107210

And if after the first Division is ended, the Quotient it self shall be divided, the Logarithme of the number first divided, shall be equal to the Logarithmes of both the Divisors, and the last quotient. Because the Divisor and the last quotient, are put in the place of the first, as if the dividend were 105, the Divisor 7 the quotient shall be 15, let this quotient be divided by 5, the quotient shall be 3, I say that the Logarithme of the number 105 is equal to the Logarithmes of 7, 5, 3, as here you see.

Divisor	7	0,845098
Divisor	5	0,698970
The last Quotient	3	0,477121
The Dividend	105	2,021189

And these three must needs follow, if we make the Logarithme of an unite to be a Cypher. And of this nature are the Logarithmes here produced, whose construction is explained in my *Trigonometria Britannica*, to which I refer thee.

CHAP.

Chap. III.

To find the Logarithme of any number given, or the number answering to any Logarithme.

HAving in the preceding Chapters shewed the nature and affections of Logarithmes in the general, and some excellencies that are in these above any other. I come now unto their use, which is twofold, the one consists in the finding of the Logarithme of any absolute number, not exceeding 600000, and the contrary.

The second use is in the easie resolution of Arithmetical Questions, and Geometrical Problems, as in the computing of the Increase and Rebate of mony and annuities, and in the measuring of Board, Timber, Stone, and such like, and many other Geometrical figures: the first of these uses shall be explained in the Problems following.

Problem I.

To find the Logarithme of a whole number.

IF the number given be under 10, you must find the number given among the great figures, in the head of the two first pages, and just under your number is the Logarithme you desire. Example, let the

Logarithme

Logarithme of 4 be required, in the head of the first column of the first page, I find the number propounded, and right under it this number, 0,602060. which is the Logarithme of 4, as was required.

But if the number given be more then 10, if it consist of two, three, or four figures, you must see the last figure in the top of the pages, and all the other figures in the first column, and in the common *Area*, or meeting of these two lines is the Logarithme you desire.

Example, Let it be required to find the Logarithme of 35: the last figure which is 5, I find in the head of the first column of the 2 page and 3, the first figure in the first column of the first page, and in the common *Area*, or meeting, there is this number, 1,544068. which is the Logarithme of 35, as was required; so that all numbers under 100, and their Logarithmes, are set down in the ten first lines of this Table, all numbers under 1000, and their Logarithmes in the 3 first leaves, and all other to 10.000 are to be found in like manner in the rest of the Table.

Thus to find the Logarithme of 257, I look for 25, the two first figures in the first column, and 7 in the top of the Table, and in the common *Area* or meeting, I find this number 2,409933. which is the Logarithme of 257, as was required.

Again, to find the Logarithme of 3478, I look

look the three first, *viz.* 347 in the first column, and 8 the last figure in the head of the Table, and in the common *Area* or meeting I find this number 3,541329. which is the Logarithme of 3478. as was required.

But if the Logarithme of a number consisting of five places be required you must find the Logarithme of the four first figures, as hath been shewed, and the common difference in the last column, signed with the Letter D, then look this common difference in the first column of the lately entituled, *A Table of the parts proportional*, and the last figure of the number given in the head thereof, and in the common *Area* or meeting of these two lines, you shall have the part proportional, which being added to the former Logarithme found, their aggregate (if you change the Characteristick 3 into four a unite more, because the number consists of a place more) shall be the Logarithme of the number given.

Example, Let it be required to find the Logarithme of 35768, the Logarithme of 3576, the four first figures will by the former directions be found to be 3, 553398 and right against that number in the last column of the Table, the common difference is 122, this difference I seek in the first column of the other Table, and 8 the last figure of the number given in the head thereof; then looking down from 8 in the

head

head of the Table, till I come againſt 122 in the firſt column, I find there 97, which being added to 3, 553398, their aggregate 3,553495 (if you take away 3, the Characteriſtick, or firſt figure, and ſet 4 in the room thereof thus, 4,553495) is the Logarithme of 35768, as was required. The like may be done for any other.

Probl. 2.

To find the Logarithme of a Fraction or broken number.

Fractions, to ſpeak properly, are numbers leſs than unity, the which though *Euclide* 2. *Definit. lib.* 7. ſeems to exclude from the nature of number, yet ſeeing that by fractions we may very often anſwer a queſtion of number exactly enough, which being added, are ſometimes equal to, ſometimes exceed the number given, and have to it a certain and manifeſt proportion: it is clear that they are homogeneal to a number of and therefore to be accounted numbers.

In this place therefore, parts or fractions are more generally taken for any number, which having the form of parts, is expreſſed by his Numerator and Denominator: whether it be an Integer, as $\frac{7}{3}$. $\frac{11}{3}$, or mixt, when parts are annexed to Integers, as $\frac{1}{4}$ $\frac{11}{3}$, or parts properly ſo called, to wit, ſuch as are leſs than unity, as $\frac{1}{4}$, $\frac{7}{15}$. In all theſe the

Denominator hath the same proportion to his Numerator, that unity hath to the parts given, for the product made of unity and the numerator is equal to the product made of the Denominator, and those parts, and and therefore by that 20 Pro. of the 7 Book of *Euclide*, they are proportional.

Proportionals.	4	4	5	Denominator.
	3	5	13	Numerator.
	1	1	1	Unitas.
	$\frac{3}{4}$	$\frac{5}{4}$	$\frac{13}{5}$	Partes.

Now then to find the Logarithme of the given parts or fraction; Deduct the Logarithme of the Denominator from the Logarithme of the Numerator, the remainder shall be the Logarithme of the parts or fraction. For seeing that in four proportionals, the sum of the Logarithmes of the mean numbers is equal, to the sum of the Logarithmes of the extreams; and that unity which is one of the mean numbers hath no Logarithme, the Logarithme of the other mean number only, that is the Logarithme of the Numerator alone, is equal to the sum of the Logarithmes of the extreams, that is, to the sum of the Logarithme of the Denominator, which is the first of the four proportionals, and the Logarithme of the parts, which is the fourth number, as is seen in these examples.

5	0, 698970	4	0, 602059
1 3/5	1, 113943	3	0, 477121
1	0, 000000	1	0, 000000
1 3/5	0, 414973	3/4	0, 124938

In which the improper parts 1 3/5 or 2 3/5 have for their Logarithme, a number exceeding the Logarithme of parts, but the parts properly ſo callled 3/5, ſeeing they are leſs than unity, have a defective Logarithme, that is leſs than 0, or the remainder of 2 leſs from which a greater was ſubſtracted, which is uſual amongſt Arithmeticians; as if 5 ſhall be ſubſtracted from 3, there will reſt −2.

Theſe things will be manifeſt enough, in theſe numbers, which are continually proportional in a twofold reaſon. In which the larger the number is, the higher doth his Logarithme aſcend above 0: and the leſs the parts are, the more doth the Logarithme of thoſe parts deſcend beneath 0, which is the term from whence the abundant Logarithmes begin to increaſe, and the defective Logarithmes to decreaſe. But the diſtance between C and D is much leſs than that between D and E; yet if the diſtance of the Logarithme B ſet beneath the term 0; ſhall be added to the diſtance which is above it, the whole diſtance between B and D ſhall be equal to the diſtance D and E, or between B and A. But thoſe defective Loga-

rithmes of parts do change their Characteriſtick in the ſame manner as the abundant Logarithmes do. For from unitie to ten the Characteriſtick is 0, from ten to a hundred 1. from a hundred to a thouſand, 2. and ſo forward, as hath been ſhewed, Chap. 2. In like manner in Defective Logarithmes, the Characteriſtick from unitie to the tenth part of an unite is 0, from the tenth to the hundred part it is 1; from a hundred to a thouſand, 2. &c. * And ſeeing that the value of the parts is alwayes the ſame, if the proportion between the Numerator and Denominator be the ſame, we may write thoſe parts ſeveral wayes, but the Logarithme of theſe parts ſhall be ſtill the ſame: to wit, the difference between the Logarithme of the Numerator, and the Logarithme of the Denominator. Which in proportional numbers is ſtill the ſame by the definition of Logarithmes. As $\frac{3}{24}$, $\frac{1}{8}$, $\frac{125}{000}$ do all expreſs the ſame parts, and the ſame defective Logarithme——0,903090 is the Logarithme of every one of them. Thus far Mr. *Brigges* hath expreſſed himſelf concerning this thing in the 10 Chapter of his *Arithmetica Logarithmica*.

* As in the Table following.

Logarithmes

*	Logarithmes
1000	3, 000000
100	2, 000000
10	1, 000000
1	0,
$\frac{1}{10}$	1, 000000
$\frac{1}{100}$	2, 000000
$\frac{1}{1000}$	3, 000000
257	3, 409933
257	2, 409933
$25\frac{7}{10}$	1, 409933
$2\frac{17}{100}$	0, 409933
$\frac{257}{1000}$	-0, 590067
$\frac{257}{10000}$	-1, 590067
$\frac{257}{100000}$	-2, 590067
3	0, 477121
24	1, 380211
$\frac{3}{24}$	-0, 903089

$\frac{10000}{8}$	1250	3, 096910
$\frac{1000}{8}$	125	2, 096910
$\frac{100}{8}$	$12\frac{5}{10}$	1, 096910 E
$\frac{10}{8}$	$1\frac{25}{100}$	0, 096910 D
Unitie.		0, 000000 C
$\frac{1}{8}$	125	0, 903089 B
1	1000	
8	125	-1, 903089 A
80	10000	
1	125	-2, 903089
800	100000	
1	125	-3, 903089
8000	1000000	

Of the ſame value.

125	2, 096910
1000	3, 000000
$\frac{125}{1000}$	-0, 903090
1	0, 000000
8	0, 903090
$\frac{1}{8}$	0, 903090

There is another way by which the Logarithme of a fraction may be fonnd, which is perhaps as eaſie in the finding, no leſs uſeful being found, it is indeed the quite contray to the former, and yet grounded on the ſame proportion, as in the former examples here again repeated.

5	0, 698970	4	0, 602059
1 3/5	0, 113943	3/4	0, 477
1	0, 000000	1	0, 000000
2 3/5	0, 414973	1/4	9, 875061

In the first of these $\frac{13}{5}$ or $2\frac{3}{5}$, which is an improper fraction, the work is perfectly the same as before, but the absolute number in the Table of Logarithmes, answering to the Logarithme thereof 0, 414973 is not $\frac{13}{5}$, or $2\frac{3}{5}$, but 2, 6. the first figure 2 is the whole part of that improper fraction, and 6 the Decimal of $\frac{3}{5}$ annexed, but in the second example, the work is various, and the Logarithme different, for whereas Mr. *Brigs* doth substract the Numerator from the Denominator, contrary to the way of improper fractions; I here substract the Denominator from the Numerator, that is, the greater from the less, and the remainder is the Logarithme of the fraction given converted into a Decimal; and therefore Mr. *Wingate* in finding the Logarithme of a Decimal fraction, to make it sutable to these directions of Mr. *Brigges*, doth take the complement Arithmetical of the Logarithme found in the Table, prefixing before it so many unites as the Decimal hath cyphers before the numeral figures, for the Characteristick thereof; whereas the Logarithme in the Table is in it self more

ready

ready for use, as shall hereafter be explained.

For the better understanding thereof, the proper Characteristicks of whole numbers must be considered, and the Characteristick of all numbers under 10 is 0, of all numbers between 10 and 100 is 1, between 100 and 1000 is 2, &c. nor will there be any inconvenience, if the Characteristick of all digits be 10, and the Characteristick of all numbers between 10 and 100 be 11, between 100 and 1000, be 12, &c. but if this be supposed the Characteristick of a number, that is, but one place beneath unity shall be 9, if it be two places, 8, and so forward. Thus the Logarithme of 5 is 10, 698970 the Logarithme of 05 is 9, 698970, and the Logarithme of 005 is 8, 698970, and upon this ground the Logarithme of the fraction ¾, or Decimal .75 is 9, 875062, as before is said.

And thus the Logarithme of a Decimal fraction, differs from the Logarithme of a whole number in nothing but the Characteristick, which must be 9, if there be no cyphers prefixt before the numeral figures, and so many figures less than 9, as there are cyphers set before the numeral figures of the fraction propounded; thus the Logarithme of this Decimal, .875 is 9, 942008. of this .0875 is 8, 942008. And the Logarithme of this Decimal .00875 is 7, 942008, in the use of which Logarithmes

ſome ſign of defection would be ſet before it, to ſign it for the Logarithme of a fraction to prevent miſtakes; for it is no impoſſible thing, to have occaſion for the Logarithme of a whole number conſiſting of 7, 8, or 9 places, and then the Characteriſtick of ſuch number, will prove the ſame with that of a fraction; and therefore to prevent miſtakes, let D or F, or ſome other note or letter be ſet before the Characteriſtick of the Logarithme of a fraction, to diſtinguiſh it from the Logarithme of a whole number.

If the Logarithme of a mixt number be required, reduce the number given into an improper fraction, then deducting the Logarithme of the Denominator from the Logarithme of the Numerator, the remainder ſhall be the Logarithme required.

Example, let $4\frac{6}{12}$ be given, this being reduced into an improper fraction, is $\frac{54}{12}$, and

the Logarithme of 54 is	1.732394
The Logarithme of 12 is	1,079181
Their difference	0,653213

is the Logarithme of $4\frac{6}{12}$ as was required.

When the fraction part of a mixt number is a Decimal, ſeek the Logarithme of the mixt number, as though it were a whole number, and inſtead of the Characteriſtick in the Table, ſet a Characteriſtick proper to the whole part of the mixt number, the

Logarithme

Logarithme so ordered, shall be the Logarithme of the mixt number propounded.

Example, 172, 68 being given, I demand his Logarithme: which being conceived as a whole number, the Logarithme thereof by the Table is 4,237242, but instead of the Characteristick 4, I set 2, because the whole part consists but of three figures, and then the

entire Logarithme of 172, 68 is 2, 237242
The Logarithme of 17,268 is —— 1,237242
The Logarithme of 1,7268 is —— 0,237242
The Logarithme of .17268 is —D.9,237242
and so of any other.

PROBL. 3.

A Logarithme being given to find the absolute number thereunto belonging.

THe Characteristick of the Logarithme given, will declare of what number of places the absolute number doth consist, the Characteristick being alwayes an unite less, than the number of places in the absolute number; if therefore the Characteristick of the Logarithme given be 0, the absolute number doth consist but of one figure, and must be found in the first line of the first page of the Table of Logarithmes.

Thus 0, 903090 being the Logarithme given, the absolute number answering thereunto is 8, which I find over the head thereof in the first line of the first page. If

If the Characteriſtick be an unity, the abſolute number doth conſiſt of two places, and muſt be found in the ten firſt lines of the Table. Thus 1, 934498 being the Logarithme given, I find the ſame in the ninth line, and the abſolute number anſwering thereunto is 86. the figure 8 in the firſt column right againſt the Logarithme given, and 6 over the head thereof, which together is 86.

If the Characteriſtick be 2, the abſolute number anſwering to the Logarithme given, muſt conſiſt of 3 places, and muſt be found in the three firſt leaves of the Table. Thus 2, 552668 being the Logarithme given, I find the ſame in the 36 line of the Table, and right againſt the ſame, in the firſt column this number 35, and 7 over the head thereof, and therefore the number anſwering to that Logarithme is 357.

If the Characteriſtick be 3, the abſolute number anſwering to the Logarithme given muſt conſiſt of 4 places, three of which muſt be found in the firſt column, and the fourth over the head of the Logarithme given. Thus 3, 553398 being the Logarithme given, I ſeek the ſame in the ſecond column of the Table, and the next leſs I find to be 3, 552668 and guiding mine eye from thence in a ſtraight line, through all the columns of the Table, in the eight column I find the Logarithme given, and over the head thereof the

the figure 6, which being added to 357, the three figures against that Logarithme in the first column, the absolute number answering to the Logarithme given is 3576.

If the Characteristick be 4, the absolute number answering to the Logarithme given must consist of five places, four of which must be found, as hath been already shewed, and the common difference in the last column must be noted, and the Logarithme found must be substracted from the Logarithme given, then seek the aforesaid common difference in the first column of the Table, entituled, *A Table of the parts Proportionall*, and the other number found by Substraction, or the nearest to it in the rest of the columns, over the head whereof you shall have the first figure sought. Thus 4,553495 being the Logarithme given, the Logarithme next less in the Table is 3,553398, and the absolute number answering thereunto 3576, against which Logarithme in the last column the common difference is 122, which I note, and substracting the Logarithme found 3,553398 from 4,553495 the Logarithme given, their difference is 97; first therefore I seek the common difference 122, in the first column of the aforesaid Table, and the other difference 97 in a right line from it, which I find in the ninth column, and the figure 8 in the head thereof; and so at last the absolute

lute number anſwering to 4, 553495 the Logarithme given is 35768.

If the Logarithme given, be the Logarithme of a fraction, ſeek the abſolute number thereof, as though it were the Logarithme of a whole number; and before the abſolute number found, prefix as many cyphers as the Characteriſtick of that Logarithme wants unites of the number nine, that number ſo ordered is the Decimal fraction anſwering to the Logarithme given.

Thus the number anſwering to this defective Logarithme, or Logarithme of a fraction, D. 7,932652 is 85635, and becauſe the Characteriſtick 7 wants two unites of nine, I place two cyphers before the abſolute number found, and then the Decimal fraction anſwering to the given Logarithme is .0085635. And theſe directions I judge ſufficient, for the finding of the Logarithme of any number, or the correſpondent number of any Logarithme given.

Chap. IV.

The uſe of Logarithmes in Multiplication.

HAving ſhewed the nature and affections of the Logarithmes in the general, and the excellency of theſe here produced above any other, together with the manner of

of finding them, as they are placed in theſe Tables, I am in the next place to ſhew their uſe in Arithmetick and Geometry. And the parts of Arithmetick in which this Table of Logarithmes is moſt uſeful, are Multiplication, Diviſion, The Rule of Three, Creation of Powers, Extraction of Roots, and the finding of mean Proportionals. And firſt of their uſe in Multiplication.

1. In Multiplication by Logarithmes, add the Logarithme of the Multiplicand, to the Logarithme of the Multiplicator, their ſum is the Logarithme of the product. Example, 144 being given to be multiplied by 12, I demand the product. The Logarithme of 144 is 2,158362, and the Logarithme of 12 is 1,079181 the ſum of theſe Logarithmes is 3,237543, which is the Logarithme of 1728. the Product required.

Multiplicand 144	2,158362
Multiplicator 12	1,079181
Product 1728	3,237543

2. Two mixt numbers being given to be multiplied, the product is found in the ſame manner. Example, let the numbers propounded be 17, 268, and $4\frac{6}{12}$ the Logarithme of 17, 268 is 1, 237242, and the Logarithme of $4\frac{6}{12}$, that is, of 4,5 is 0,653212 the ſum of theſe Logarithmes is 1, 890454, which is the Logarithme of 77,706 the product demanded.

Multi-

Multiplicand 17,268 ——— 1,237242
Multiplicator 4 6/12, or 4,5 ——— 0,653213
Product 77,706 ——— 1,890455

3. A whole number, and a mixt be given to be multiplied, the product is fou in the same manner.

Example, let 172,68 be given to be mu tiplied by 12, the Logarithme of 172,68 2,237242, the Logarithme of 12 is 1,07918 their sum 3,316423 is the Logarithme 2072,2 the product.

Multiplicand 172,68 ——— 2,237242
Multiplicator 12 ——— 1,079181
Product ——— 3,316423

4. Two fractions being given to be mu tiplied, the product is also found in the sam manner.

Example, let .25 be given to be multiplie by 3/4, or .75 the Logarithme of .25 is D. 9,397940, and the Logarithme of .75 i D. 9,875061 their sum is th Logarithme of

Multiplicand 25 ——— D. 9,397940
Multiplicator 75 ——— D. 9,875061
Product 1875 ——— D. 9,273001

CHAP.

Chap. V.

The use of Logarithmes in Division.

Division by Logarithmes is performed by subtracting the Logarithme of the Divisor from the Logarithme of the Dividend, the remainder is the Logarithme of the Quotient, as by the examples following shall be made more plainly to appear.

1. Example, Two whole numbers being given, as 1728 to be divided by 12, the Logarithme of 1728 is 3, 237543, and the Logarithme of 12 is 1, 079181, which being deducted from 3, 37543, the remainder is 2, 158362 the Logarithme of 144 the Quotient.

Dividend 1728	3,237543
Divisor 12	1,079181
Quotient 144	2,158362

2. Example shall be of two mixt numbers, as 77, 706. to be divided by 4, 5. the Logarithme of 77 706 is 1, 890454, from which deducting 0, 653212, the Logarithme of 4, 5. the remainder is

Dividend 77,706	1,890454
Divisor 45	0,653212
Quotient 17,268	1,237242

3. Example, of a mixt number to be divided by a whole as 2072, 2, to be divided by 12.

Dividend

Dividend 2072, 2 ——— 3,316423
Divisor 12 ——— 1,079181
Quotient 172,68 ——— 2,237242

4. Example of two fractions as $\frac{3}{4}$, or .75 to be divided by .0375 the Quotient is 20.

Dividend .75 ——— D 9,875061
Divisor .0375 ——— D 8,574031
Quotient 20 ——— 1,301030

If in Division by Logarithmes any doubt shall arise concerning the nature of the quotient, consider whether the Divisor be greater than the Dividend, or whether it be less; if it be less, the Quotient is a whole or a mixt number, if greater, it is a fraction.

Chap. VI.

The Rule of Three, or Logarithmetical Rule of Proportions.

THe common Rule of Proportion sheweth how from three numbers being given a fourth proportional number may be found by Multiplication and Division: This Rule performeth the same thing, but much more easily by Addition and Substraction.

If from the sum of the Logarithmes of the second and third, the Logarithme of the first shall be substracted, the remainder shall be the Logarithme of the fourth

fourth, as if there were given 3. 8. 18. Logarithmes.

Prop.
- 3.0,477121. A — D. *Is the sum of the Means from which* A *being deducted, the remainder is* E, *the Logarithme of* 48 *the fourth proportional number.*
- 8.0,903089. B
- 18.1,255272. C
- 2,158361. D
- 48.1,681240. E

The truth of this Propoſition is demonſtrated, from the very definition of Logarithmes, and the ſecond *Lemma* of the firſt Chapter; for the ſum of the means is equal to the ſum of the extreams; and therefore the difference between the firſt and the ſecond, is the ſame with the difference between the third and the fourth. And the proportion of the firſt to the ſecond, is the ſame with that of the third unto the fourth.

We may find the ſame fourth Logarithme ſought, if inſtead of the firſt Logar. we take his compl. Arithmetical (as hath been ſhewed in the Chapter) and add the ſame in the ſame ſum with the two other that are given. This ſum, if you take away the note of unitie ſet in the firſt place towards the left hand, ſhall be the Logarithme of the fourth inquired. The reaſon is this, whereas the firſt Logarithme ſhould have been ſubſtracted from the reſt; we do not only not ſubſtract any thing, but to the other we add his complement alſo, that is, the remainder of ten. ſo that the whole doth contain more than

the fourth inquired, not only the firſt Logarithme, but his Complement alſo, that is the whole ten. And therefore the note of unitie being ſubſtracted, which is alwayes in the firſt place (that is, ten being ſubſtracted) the remainder is the fourth Logarithme, as here you ſee.

	Logarithmes.	*Complement.*
Prop.	6.0,778151	6—9,221849
	15.1,176091	15.1,176091
	26.1,414973	26.1,414973
	2,591064 ſum	65.1,812913
	65.1,812913 fourth.	

And if two or more Logarithmes be to be ſubſtracted, we may add the Complemes of every one, deducting from the whole ſo many unities as there were complemens added.

But theſe are common things, ſave only the manner of working: ſome things follow, which may eaſily be performed by Logarithmes, ſcarce poſſible without them. Three numbers being given, if we ſuppoſe a rank of as continual proportional numbers, as you pleaſe, to be ſet between the third number given and the fourth proportional, and that rank of numbers to be continued to them both, we may find any of them, whoſe ſite or place is given: I ſay In a rank of numbers continually propor-

on

onal, if the proportion and diſtance of two terms ſhall be given, together with any number of terms you will; we may find another, whoſe diſtance above or beneath the term given, is alſo known.

Let the three given numbers be A 8, B 27, C 432, and let the proportion of the firſt proportional to the fourth be as A to B, a number above C is inquired, between which and C let there be four means or five intervals.

Firſt you muſt take the Logarithmes of the numbers A and B, and their difference, which let be F, and ſeeing there are three intervals between the firſt and fourth, let a third part of this difference be taken as G. This part ſhall be the difference of the Logarithmes for one interval, or for as many of the next numbers as you will in the whole ranck.

Then of the given numbers C 432, take the Logarithme D, and if we would have the next number above or beneath the number given, let the difference of one interval be added to or deducted from the Logarithme D. But if we ſeek another more remote from the number given, the difference G muſt be multiplied by a number proportional to the diſtance, and then added to or deducted from the given Logarithme D, the whole or remainder being found in the Table of Logarithmes, doth in

the margine ſhew the number ſought, as here you ſee.

A 8 ——	0,903089	
B 27 —	1,431363	
Differ. —	0,528274 F	
$\frac{1}{3}$ *Differ.*	0,176091 G	
C 432 —	2,635483 D	
	0,176091 G	
648 —	2,811575 D+1G	
972 —	2,987666 D+2G	
	0,880456. 5 G	
3280.5 —	3,515490 D+5G	
C 432 —	2,635483	
	0,528273. 3 G	
128 ——	2,107210 D—3G	

Numbers continually proportional.

	3280.5 —	9
	2187 —	8
	1458 —	7
	972 —	6
	648 —	5
27	432 *Dat.*	4
18	288 —	3
12	192 —	2
8	128 —	1

8
27
432
1458
} Propor.

And in this manner we have found 648 the next number above C by adding the difference G, and 972 the ſecond, and 3280.5 the fift number from thence the ſame way. In like manner by ſubducting the difference G trebled, we have found 128 the third beneath C. The truth of all theſe is clear from the firſt definition: which proveth theſe numbers to be proportional, whoſe Logarithmes have equal differences. And

this

this is that truly Golden Rule of Proportional numbers, which giveth us not only the third or fourth, or mean proportional, but also any of the continual proportionals between the third and fourth, or beyond; whether we seek that which is more remote, or that which is nearer, from this rule as from a fruitful fountain, do many of these things flow, which here do follow.

Chap. VII.

To find the Sides or Roots of any number given.

IN numbers continually proportional from unity, As 1, 3, 9, 27, 81, 243, 729, 2187. that number which is next to unity is said to be the Root of all that follow, and the following numbers are called the powers of that Root: because they are made by the multiplication of that Root into it self, and of it self into the products. The second of these from unity is called the Square, or Quadrate, the third the Cube, the fourth the Biquadrate, and the rest that are more remote, have their names according to the distance that they have from unity; as the fifth is called the fifth Power, and the rest in like manner. And the characters by which they are known and distinguished from one another are the numeral

notes included with little circles, as here you ſee.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	3	9	27	81	243	729	2187

In theſe, 3 *is the Square Root of* 9, *the ſame* 3 *is the Cube Root of* 27, *and the Biquadrate of* 81.

And alſo the (7) ſide or Root, of the ſeventh Power 2187, which here is the laſt. According therefore to thoſe things which are delivered in the former Chapter, take the difference between the Logarithmes of unity and the number propounded, (that is, the Logarithme of the number given, ſeeing the Logarithme of unity is a cypher) and divide the ſame by the number of intervals between unity and the given number, the quotient ſhall be the Logarithme of the Root inquired; as if the ſquare root were ſought, take the half of the given Logarithme; if the Cube the third part; if the Root of the (7) power, the ſeventh part thereof; and ſo forward, this part ſhall be the Logarithme of the Root inquired.

As if there were given 15625 the ſixt power, the Logarithme of this number is .4,193820. the (6) ſide or root inquired, take therefore the ſixt part of the given Logarithme 0,698970 the number anſwering to this Logarithme is 5. I ſay that 5 is the root inquired, as is apparent in theſe numbers. 1,5,25,125,625,3125,15625.

Let

Let the Cubick number given be 979; the Cube Root inquired. The Logarithme of the given number is .2,990780, of which the third part 0,996927 must be taken. In this example, as in the former, the Characteristick, which as hath been said, is the first figure towards the left hand, is carefully to be considered. Therefore when the third part of the first figure of the given number cannot be taken, I put 0, in the first place of the quotient, for the Characteristick thereof, which sheweth the Root inquired is less than ten.

And in this manner the Root of any power given may be had, if not exactly, yet very near. And not only the Root, but any other of the same rank, either between unity and the given power, or in any degree more remote. As if the sixt power given were 15625, the Logarithme of the Root is found to be 0,698970. If I desire to know the fourth power of that Root, I multiply the Logarithme of the root found by four, the product is 2,795880, and the number answering thereunto is 625. But if I would know the ninth power, I multiply that Logarithme by 9, the product 6,29073 shall be the Logarithme thereof, whose Characteristick 6 sheweth that there are seven places in the number sought, and therefore it is greater than can be found in these Tables, and consequently we must content

our ſelves with the five firſt figures, and leave the Inquiſition of the other two, to be found by a Table of Logarithmes made to a larger *Radius*.

1
$\frac{1}{2}$ (1) $\frac{1}{31}$ (4) *There are alſo the ſquare, Cubick, and other Roots of Fractions, as here you ſee. And theſe may be found by Logarithmes.*
$\frac{1}{5}$ (2)
$\frac{1}{27}$ (3) $\frac{1}{243}$ (5)

Firſt, find the defective Logarithme of the fraction given, as hath been ſhewed in the 2 Problem of the 3 Chapter: The half thereof ſhall be the Logarithme of the ſquare Root, a third part the Logarithme of the Cubick Root, &c.

For example, let the fraction given be $\frac{1}{3}$, the defective Logarithme thereof according to Mr. *Brigges* his way is —0,528274, let the Cubick Root of this fraction be required; you muſt take a third part of the given Logarithme, which is —0,176091, the number anſwerable to this Logarithme ſhall be the Denominator of the parts inquired, whoſe Numerator ſhall be unity.

The Denominator ſhall be $1\frac{1}{100}$, for it muſt be leſs than ten, becauſe the Characteriſtick is 0, and therefore the Root inquired $\frac{1}{1}$. If the ſquare Root of this fraction were inquired, you muſt take the half of the given Logarithme —0,264137, whoſe abſolute number 1,8371 is the Denominator of the Root inquired, whoſe Numerator is 1; and ſo the ſquare Root of the fraction given

is $\frac{10000}{18371}$. And that the Numerator of the fraction must be 1, appears from hence, in that the difference between the Logarithme of the Numerator, and the Logarithme of the Denominator is the Logarithme of the fraction, as hath been shewed Chap. 3. Probl. 2. If therefore the Denominator answerable to this Logarithme be inquired, it must needs be that the Logarithme of the Numerator should be 0, that is, that the Numerator should be 1, or else it could not be, that that given difference of the Logarithmes should perform the work required, and the complement Arithmetical of this Logarithme, will be the Logarithme of the Decimal of this fraction Root.

Thus the Arithmetical Complement of 0,176091 is 9,823909, whose absolute number. 6667 is the Decimal answering to $\frac{2}{3}$ or $\frac{2}{3}$ the Cubick Root of the fraction $\frac{8}{27}$ required.

We may also find any Root of a fraction given, if we find the Roots of the Numerator and Denominator, as the Cubick Root of $\frac{8}{27}$ is $\frac{2}{3}$.

For the Roots of the given terms are of the same kind with the Root of the term inquired, as the Cubick Root of the fraction $\frac{8}{27}$ is $\frac{2}{3}$ whose Numerator 2 is the Cubick Root of the Numerator 8, and the denominator 3 is also the Cubick Root of the Denominator 27.

The

The given Terms	8	0,903090.	3 A
	27	1,431364.	3 B
The Terms inquired	2	0,301030	1 A
	3	0,477121	1 B

Absolute numb. 6667—9,823909. 1 A-1 B

So that the Cubick Root of the fraction given $\frac{8}{27}$ is $\frac{2}{3}$, as before, and the Decimal answering thereto is .6667.

If we desire the parts of any other number in the same rank with the Root, let the Logarithme of the Root be multiplied according to the distance thereof from unity, the product shall be the Logarithme of the number inquired, as if the fraction given were $\frac{3125}{16807}$ of four continual proportionals between unity and the given fraction, I desire to know which is the third of them from unity. Now seeing there are four means, there must be 5 intervals, & the fift part of the Logarithme of the fraction given, shall be the Logarithme of the Root, which being trebled shall be the Logarithme of the third number from unitie. The whole operation followeth.

The given fraction $\frac{3125}{16807}$— B. 3,494850
4,225490

The Logar. of the fraction A-0,730640.5 B
The (5) Root———— B-0,146128. 1 B
Logarithme of the Cube—C-0,438384.3 B
D-1,022896.7 B

The

The Cube or third from unity required $\frac{1000}{2744}$ or $\frac{125}{343}$.

If the seventh from unitie be required, let the Logarithme of the Root be multiplied by 7, the product D. 1, 022896 will give $\frac{10000000}{10141564}$ or $\frac{78125}{823543}$.

And thus we may find any number less than unity, in the same rank with the number given. And if we desire to know any number in the same rank continued above unity, let the same Logarithme of the Root be multiplied by the number of the intervals between unity and the number sought, the product shall be the Logarithme of the number inquired. So that the Logarithme of the numbers equally distant from unity either way shall be one and the same, with this difference, that the Logarithme of a number above unity shall be abundant, the Logarithme of a number beneath unity shall be defective.

And as the Logarithmes of numbers equally distant from unity both wayes, do consist of the same Numeral figures; So the the same terms being transposed, do express both the absolute numbers, as in those very numbers which we found; but now $\frac{1}{5}$ and $\frac{7}{5}$ are both alike distant from unity, the Cube or third distance from unity in both, are $\frac{1000}{2744}$ and $\frac{2744}{1000}$; or $\frac{125}{343}$ and $\frac{343}{125}$, and unitie is always a mean proportional between both the numbers

numbers equally distant in the same rank. And in this manner in numbers continually proportional, from unity, we may from the fraction parts ascend to the Integers; and on the contrary, from the Integers we may descend unto the fraction parts.

Chap. VIII.

Two numbers being given, with the number of the means between them continually Proportional, to find any one of them in the same rank.

WE have already shewed in numbers continually proportional from unity how the number next to unitie, or any other above or beneath the number given may be found.

And now we are to shew, how any one of the means required between any two of the proportional numbers may be found also. The which not needing a new precept, I will endeavour to explain by one or two examples; let the two numbers given be 729 and 15625, and let there be 5 means between them.

You must take the Logarithmes of the given numbers, and the difference of those Logarithmes, which must be divided into six parts, according to the number of the intervals between the given numbers. Then

A the sixt part of the given difference, multiplied according to the distance of the number sought, from the number given, be either added to, or deducted from the Logarithme of the given number, the sum or remainder shall be the Logarithme of the number inquired, as here we see.

The given numbers { 729 B 2,862727 / 15625 C 4,193820

1,331093 A 6
A 0,221848 A 1
D 0,887395 A 4
B 2,862727
5625 3,750122 B ✱ D
94.4784 1,975332 B — D

120563 11/81 5,081215 C ✱ D
2025 3,306425 C — D

94.4784 B—D
157.464
262.44
437.4
729 B
1215
2025 C—D
3375
5625 B ✱ D
9375
15625 C
26041 2/3
43402 7/9
72337 37/81
120563 10/11 C ✱

If

If A the sixt part of the difference of the Logarithmes given shall be multiplied by 4, and the product D shall be added to the Logarithme of the number B, the sum shall be 5625, the fourth of the continual proportionals above B; but if it be substracted from it, it will give 94,4784, the fourth below it; The numbers above and beneath C are found in the same manner.

Another Example.

Let the given numbers be 10 and 11, and between them twelve intervals.

The numbers given	10 B	1,000000
	11 C	1,041392
		0,041392. 12 A
	A	0,003449.

I desire to know the seventh from the less between the given numbers, which is 10,5717219.

	B	1,000000
		0,024146. 7 A
10,5717219		1,024146 B + 7

And in this manner may we find any other between or beyond the numbers given. As shall be more fully explained in the Questions of Anatocism, or Compound Interest.

And the Questions of Compound Interest are either such as concern the Increase or Rebate of Mony and Annuities, or such as concern the purchase of Annuities, all which Mr. *Brigges* in his *Arithmetica Logarithmica*

mica, Chap. 17. hath expressed in 14 Propositions following.

Proposition. 1.

To find what a sum of mony will be augmented to at a certain rate, being forborn for time to come, or being due at a time to come, what is it worth in ready mony.

Let 123 pound be the principal mony given, I desire to know, to what sum it will be augmented, at the end of a certain number of years, months, and dayes at 6 *per cent. per annum*, Compound Interest, which rate amongst the Ancients (who judged Usury to be unlawful) was thought civil and reasonable, and is the rate of Interest with us at this day; for the resolution of Questions concerning the Increase of Mony at this rate, some general preparations must be made.

First take the Logar. of the given terms of Proportion 100, and 106, and their difference B, which may be called the yearly Rate or Increase, this being divided into twelve parts, will in the quotient give the monthly difference C: which being divided by 30, almost as many days as there are in an equal month, will give in the quotient the Diurnal difference D; which if we would have more exactly, the annual difference must be divided by 365, the number of dayes in a common *Julian* year. Then take the

Loga-

Logarithme of the Principal mony given.

The terms of the given proportion. { 100—2,000000
106—2,025306

B 0,025306 *Annual differ.*
C 0,002109 *Monthly differ.*
D 0,000069 *Daily differ.*

The Principal A 2,089905

These things being thus prepared, if it be required to know, how much this Principal will be augmented to, at the end of seaven years, 5 months and 9 dayes; let these differences be multiplied by their own numbers, and let the sum of their products be added to the Logarithme of the Principal, the whole shall be the Logarithme of the sum of the Principal and Increase at the end of the time appointed.

The difference for 7 Years, 0,177141,78
5 Months, 0,010544,5
9 Dayes, 0,000621,9

The sum of the Factors E 0,188309

The Logarithme of the principal { 2,089905,123 *l.*

The sum 2,278214. 189,7643
The remainder 1,901596. 79,7125

But if the same sum of the Factors shall be deducted from the Logarithme of the Principal, the remainder shall be the Logarithme

garithme of the juſt price, for which that ſum may be purchaſed with ready mony, not being due till ſo many years, months, and dayes, as in this example.

I ſay that 123 pounds at the end of 7 years 5 months and 9 dayes, is worth 189, 7642, that is, 189. 15 *s.* 4 *d.*

And if the day of payment, of the ſaid 123 pounds, be not till ſo many years, months and dayes yet to come, the worth thereof in preſent mony is 79, 7253, or 79:. 14:. 6. 06.

And at the ſame rate of Intereſt. I ſay, The Principal 79: 14—— 6, 06 after 14 years 10 months and 18 dayes is worth 189——15——3. 41. The work will be ſtill the ſame at any other rate of Intereſt, for any time propoſed before or after the day of payment.

And from this Propoſition Mr. *Oughtred* hath grounded his firſt two Fundamental Theorems.

One for the finding to what ſum any Principal will be augmented, being forborn for a certain time.

And the other for the finding of the preſent worth of a ſum of mony not due till a day, or time to come: and both theſe do depend upon the finding of Geometrical mean Proportionals, as hath been ſhewed in Natural Numbers, in the firſt Chapter of the firſt Part hereof: more eaſily by Logarithmes

in the laſt aforegoing. The which two Theorems according to the given rate of 6 *per cent.* ſhall be further explained in the queſtions following, to which purpoſe I have here added the following Tables of Years, Months, and Dayes: The Table of Years is made by the Multiplication of the former Annual difference by all the 9 Digits, the Table of Months by multiplying the monthly difference 11 times, and the Table of Dayes, by multiplying the Diurnal difference after the ſame manner, and theſe ſhort Tables thus eaſily compoſed, are fully ſufficient for the reſolution of all Queſtions in Compound Intereſt at 6 *per cent. per annum.*

A Table of the Logarithmes ſhewing the Increaſe of 1 *pound for any time propounded at* 6 per cent. per ann. *Compound Intereſt.*

	Years.	*Months.*	*Dayes.*
1	0,025306	0,002109	0,000069
2	0,050612	0,004218	0,000139
3	0,075618	0,006327	0,000208
4	0,101224	0,008435	0,000277
5	0,126529	0,010544	0,000347
6	0,151835	0,012653	0,000416
7	0,177141	0,01476	0,000485
8	0,202447	0,016879	0,000555
9	0,227753	0,018979	0,000624
10	0,253059	0,021088	0,000693
11	0,278265	0,022107	0,000762

Queſt

Quest. 1. *If 137 l. 9 s. be forborn 5 years 7 months and 15 dayes, accounting Interest upon Interest at the rate of 6 per centum, for a years time; To what sum will it then amount?*

The Logarithme shewing the Increase of 1 l. for——5 years is 0,126529
7 months is——0,014762
10 days is——0,000693
5 days more——0,000347.

The total——0,142331 of the factors.
Logar. of Principal——2,138145: 137 l. 45

The sum——2,280476. 190.75.

Here I adde the Logarithmes of 5 years 7 months and 15 dayes together, and their sum is the Logarithme of the increase of 1 pound for that time, to which I add the Logarithme of the Principal 137. 45, and the total 2,280476 is the Logarithme of the 190, 75 the increase thereof for the time propounded.

But because the year cannot be divided into 12 equal parts or months, it will be perhaps better to resolve these questions by years and dayes, only neglecting the months; I will add an Example of that also.

Quest. 2. *If 68 l. 7 s. 6 d. be forborn 27 years, and 165 dayes; To what will it then amount at 6 per centum?*

The Logarithme shewing the Increase of

1 l. for 20 years is 0,506120
7 years is 0,177141
100 dayes is 0,006930
60 dayes is 0,004160
5 dayes is 0,000347
The sum of the Factors 0,694698
The Logar. of the Princ. 1,834897. 68,37

The sum 2,529595. 338.

the sum to which it will be augmented in th
time.

Or this question may be resolved in th
manner, multiply the annual differenc
0,025306, by the years and Decimal pa
of the year given; and the product add
the Logarithme of the Principal means in th
question, that shall be the Logarithme of th
sum inquired.

The annual difference. 025306. 4,40321
Years and Parts 27,452 1,438597

The Product 694700 5,841797

The Log. of the Princ. 68,375. 1,834897
The product add 0,694700

The absolute numbers 338,53. 2,529595
so that 68 l. 7 s. 6 d. being forborn 27 years
and 165 dayes will at the end of the time be
augmented unto 338 l. 10 s. 7 d.

The second Theorem being deduced from
this first Proposition, is to find the present
worth

worth of a sum of mony not due till a time to come, for the Explanation whereof one example will be sufficient.

Quest. *If* 137 l. 9 s. *be due at the end of* 5 *years* 7 *months and* 15 *dayes; What is it worth in ready mony, Rebate being made at* 6 *per cent. per ann. Compound Interest?*

For the resolution of this question, and all other of the same kind, you must proceed as hath been shewed in the former questions; only at last, instead of adding the sum of the product to the Logarithme of the Principal, you must deduct the products from it, the remainder is the Logarithme of the sum required.

The Logarithme of the Princ.	2,138145
The sum of the Products	0,142331
The present worth	99,041 1,995814

Propos. 2.

The Principal, together with the Interest for a certain time being given, to find the Rate of Interest for a year or a months time.

Let the Principal given be 1234. to this Principal in ten years I desire to add 766, that the sum of that Principal and Interest may be made 2000 pounds.

Take the difference between the Logarithme of the Principal, and the Logarithme

of the Principal and Interest added toge
the tenth part of this difference shall be
Annual difference, which being added
the Logarithme of the Principal, shall g
the Logarithme of the Principal and Inter
for one year.

The Principal given 1234		3,0913
The Principal increased with 10 years Interest	2000	3,3010
The 10 years difference is		0,2097
The Annual difference		0,0209
Principal and Interest for 1 year 1295. 05		3,1122

This Annual difference added to the L
garithme of 1000 shall give the true yea
Incr. of the Interest above 1000. 3,0000
The Annual difference 0,0209

The absolute number 1049,5 3,0209

I say that a thousand pound in a years ti
hath gained 49. 101. *ferè*.

Propositio 3.

What will a Rent or Pension amount
at the end of a certain number of years;
for what may it be bought before the
appointed for the first payment?

This Proposition consisting of two par
Mr. *Oughtred* divides into Theorems.

1. To find the Increase of Annuities, fo
any time and rate propounded.

2. To

2. To find their preſent worth.

When a yearly Rent or Annuity is forborn a certain number of years, to find what it will amount unto according to any rate propounded.

1. Suppoſe the Annuity given to be the Intereſt of a certain ſum of mony, and by the firſt Propoſition find out a Principal correſpondent to that Intereſt.

2. Find unto what ſum that Principal will be augmented, according to the rate given at the end of the term propounded. This done, if you deduct the Principal out of that ſum, the remainder is the ſum you look for.

Example, If an Annuity of 57 *l.* be forborn for 10 years; To what ſum will it be then augmented?

1. To find the Principal, which according to the given rate, will yield 57 *l.* for one years Increaſe: I ſay,

The Principal found	6	0,778151
	100	2,000000
	57	1,755875
	950	2,977724

2. To find unto what ſum this Principal will be augmented at the end of 10 years; by the firſt Propoſition of this Chapter, The terms of the given rate muſt be taken, and their Logarithmes, and the difference of thoſe Logarithmes, which being multiplied by the number of years, and added to the

Principal found, will give the Logarithme of the sum to which that Principal will be augmented.

The terms of the rate given	100	2,000000
	106	2,025306
The Annual difference		0,025306
Difference for 10 years		0,253060
Logarithme of the Principal found 950		2,977724

The Incr. of that Princ. 1702.30. 3,230784 from which deduct the Principal 950. 00 the remainder 751. 30 is the sum to which that Annuity will be augmented in that time.

2. To find the present worth of Annuities, you must proceed as hath been already shewed, only at last instead of adding the Logarithme of the difference to the Logarithme of the Principal, you must deduct it, and the remainder shall be the Logarithme of a number, which being deducted from the Principal found, will give the present worth of that Annuity.

Example.

Logar. of the Principal 950.	2,977724
Difference for 10 years deduct.	0,253060
The absolute number 530.47	2,724664

The

The Principal	950. 00
From which substract	530. 49
The present worth of that Annuity	418. 51

But if the first payment of this Annuity were not till the end of 5 years, the Increase of the Annuity of 57 *l. per annum* found to be 751. 30, is not to be paid until the end of 14 years; To know therefore what this sum not due till 14 years hence is worth in ready mony, if the Logarithme difference answering to 14 years, shall be substracted from the Logarithme of the sum, to which the Annuity will be increased in ten years, *viz.* 751. 30, the remainder in the Logarithme of 332. 30, the present worth of that sum.

The Increase of Ann. 751.30.	2,875816
14 years difference	0,354282
The present worth 332. 30	2,521534

Proposition. 4.

A sum of Mony being being propounded together with the Rate of Interest, to find what Annuity, to continue any number of years, that sum will purchase.

Let 300 be the sum given, the rate as 100 to 106, the time 10 years, and the first payment at the end of 5 years, the question is, What Annuity that sum will purchase.

This Question can scarcely be resolved other-

otherwise than by Proportion, in this manner.

Suppose any Annuity for the time in the question, and by the third Proposition in this Chapter, find the present worth thereof. Then by Proportion.

As that present worth, is to the Annuity supposed.

So is the sum of mony given, to the Annuity sought.

Let the supposed Annuity be 6 pound, the Principal answering to the given rate 100 which in a years time will be augmented to 106.

The terms of the given rate are { 100	2,00000
{ 106	2,02530
Annual difference	0,02530
10 Years difference	0,25305
The given Principal 100	2,00000
Princ. augmented in 10 years,	2,25305

The absolute number 179.08.

But the Logarithme of the Principal being substracted from the 10 years difference, the remainder is the Logarithme of the true worth of that Annuity, at the 10 years end, *viz.* 79,085. But this 10 years Annuity is to begin after 4 years; seeing the first payment ought to be at the end of 5 years. The Principal must therefore be found, which being augmented according to the given rate for 14 years, will give 79,085.

The

The value of the Annuity at 10 years end 79, 085	1,898093
14 years difference ſubſtracted	0,354282
The Log. of the Princ. ſought whoſe abſolute number is 34,979, which being augmented according to the given rate for 14 years, will give the ſame ſum, which the Annual Penſion of 6 pound doth give at 10 years end.	1,543811

And therefore this Principal is the juſt price of the yearly Penſion, which being found, I ſay by Proportion.

As the Principal 34,979	1,543811
Is to the Penſion 6	0,778151
So is the Principal 300	2,477121
	3,255272
To the Penſion ſought 51,459	1,711461

And thus at length the Annuity ſought, is found to be 51,459. to begin at the end of 5 years, and to continue for 9 years following, if 300 *l.* be ſuppoſed to be the Purchaſe mony.

And this Propoſition is the converſe of the third, as hath been ſhewed in the 7. Chapter of the firſt Part; ſo there is there added another Propoſition or Theorem for the Purchaſe of Annuities by future payment deduced from the Theorem, ſhewing the Increaſe of Annuities in the 5 Chapter of that Part.

The

The Theorem is.

As the Increase of an Annuity, is to that Annuity, so is the sum of money given, which by supposition is made the Increase of another Annuity.

To the Annuity sought.

Example. Let 300 be the Purchase money given, the time and rate the same formerly set down in this Proposition, in which 6 *l.* is the Annuity supposed, 100 the Principal which in 10 years time will be augmented to 179,08; but because the first payment by the former supposition is at the end of five years, we must find the present worth of that sum not due till 14 years hence.

The Increase of the Annuity at 10 years end 179,08	2,253053
14 years difference substract.	0,354282
The present worth 79,209	1,898771

which 79,209 being augmented according to the given rate for 14 years will give the sum, which the Annual Pension of 6 pound doth at 10 years end.

Hence to find what Annuity 300 *l.* will purchase, I say.

As the Principal 79,209	1,898771
Is to the Pension 6	0,778151
So is the Principal 300	2,477121
	3,255272
To the Pension sought 22,724	1,356495

And

And thus we have found that 300 *l.* not due till 14 years hence will purchase an Annuity at 6 *per cent.* of 22,724. for 10 years the first payment to begin at the end of 5 years yet to come.

There is one Question more performed by natural numbers in the first part hereof, of which Mr. *Brigges* hath made no mention, namely, this

Proposition. 5.

The present worth of an Annuity being given to find the rate of Interest which is allowed for the purchase mony:

The which by Logarithmes may be resolved at 2 or 3 trials in this manner; The rate of Interest allowed for mony, being seldom less than 3 *l.* per cent. or more than 15 *l.* not

Quest. *An Annuity of* 100 *l. per annum for* 7 *years, being to be sold for* 500 *l. present mony; what rate of Interest hath the Purchaser for his mony?*

An Annuity of 1 *l. per annum* is worth at 12 *l. per cent.*	4,56375
An Annuity of 1 *l. per annum,* is worth at 9 *per cent.*	5,03295
Their difference is	.46920
The present worth given is 500 *l.* or 5 years purchase	5.0000

The

The present worth at 12 *per cent.* 4, 5637

Their difference is 0,4361

The difference between 12 *per cent.* and 9 *per cent.* is 3 pound. Therefore.

If the first difference 0,46920 } 0,31864

Complem. Arith. }

Give 3 *l.* pound 0,4771

What shall 0,643625 9,6397

Absolute number 2,7893 0,44549

which being subtracted from 12, the remainder 9,2107, or 9 *l.* 4 *s.* 2 *d.* ½, is the rate of Interest allowed in this purchase.

And this I suppose is fully sufficient, to shew the use of Logarithmes and Arithmetick in the General, and more especially in the easie resolution of all questions concerning the Increase or Rebate of mony for any time or rate propounded.

AN

AN APPENDIX CONTAINING The *Description* and *Use* OF THE CARPENTERS RULE.

With the Application of DECIMAL FRACTIONS AND THE Table of LOGARITHMES,

To the Measuring of *Glass*, *Board*, *Timber*, *Stone*, and such like.

London, Printed in the Year 1667.

AN

APPENDIX

CONTAINING

The Definition and Use

OF THE

CARPENTERS RULE,

With the Explication of

DECIMAL FRACTIONS,

AND THE

Table of LOGARITHMES,

To the Measuring of Glass, Board, Timber, Stone, and such like.

Chap. I.

The Description and use of the Carpenters Rule.

THe Carpenters Rule is in length generally two foot, or 24 inches, according to the Standard, each inch being divided into 8 parts, that is, into halfs, quarters, and half quarters: the half inches are known from the quarters, and quarters from the half quarters by short, longer, and longest strokes, and at every whole inch is set figures, proceeding from 1 to 24, from the right hand to the left; those parts and figures are set upon both edges, of one side the Rule, and are numbred both wayes, that how ever you hold the Rule on that side, it may be still ready for your use.

On the other side yon have the Lines of Board and Timber measure, the Construction whereof shall be shewed in the following Problemes, the use is thus.

1. *Of the Line of Board Measure.*

If the breadth of any Superficies (as Board, Glass, or the like) be given in inches and parts of an inch, you may by this Line find how much of that in length will make a

foot ſquare; that is, how much of that Superficies in length is equal to another Superficies, that is, 12 inches broad, and 12 inches long, for right againſt your breadth given; upon the other ſide of your Rule you have the number of inches in length which will make your breadth equal to a foot ſquare.

Example. Let the breadth given be nine inches, right againſt nine inches in the line of Board meaſure, you find 16 inches, and ſo much in length will make one foot, by which length meaſuring the whole length of your Superficies given, you may find the content thereof in feet. But if the breadth of your Superficies be leſs than 9 inches, you muſt have recourſe to the Table, in the head whereof is ſet your breadth, and right under it the length of the Superficies, which will make a foot of ſuperficial meaſure.

Example. Let the breadth given be 8 inches, then will 2 foot 4 inches, and ⅔ of an inch in length make a foot.

2. *Of the Line of Timber.*

If a peice of Timber, or other ſolid body perfectly ſquare, ſeek upon your Line of the number of inches, that your ſolid will be ſquare, and right againſt that number of inches, upon the other ſide is the number of inches and parts in length which will make a foot.

Exam-

Example. Suppose your solid given were 9 inches square, that is, 9 inches on every side, right against 9 in the Line of Timber measure, on the other side standeth 21 inches, 7 eighths of an inch almost, and so much in length will make a foot.

If it be but a small peice of Timber, which is to be measured as under 9 inches square, you must have recourse to the Table, and seek the square in the upper rank of the Table, and right under, you have the feet, inches, and parts, that goeth to make a foot square, as in the Table of Board measure.

Example. Let there be a piece of Timber propounded that is 5 inches square, right under 5 inches in the head of the Table, I find 3 foot 9 inches, 1 eight of an inch.

But if your solid given be not just square, but broader at one side than at the other, then will this Line or Table stand you in no steed, it being made for such solids only as are perfectly square, which is but seldome, and therefore is not of much use: and the usual way (by which the Carpenters do measure such Timber) is very erroneous, which is thus:

If a piece of Timber be 15 inches one way, and but 9 inches the other, they add both two together, which make 24, and of the half thereof they take for the just square of that piece, and therefore say,

that 12 inches, or a foot in length will mak
a foot ſquare; but in this example the
will be 108 leſs than a true foot, for
you multiply 15 by 9, the product 135
the baſe of the ſolid given, which be
multiplied by 12, the ſuppoſed length o
foot, the product is but 1620 inches, when
as in a foot of Timber there muſt be 17
inches, 108 inches more.

To avoid this inconvenience, it is nec
ſary that the Artificer ſhould have ſo
Arithmetical skill, which being ſuppoſe
and his Ruler divided according to t
following directions, any queſtion concer
ing Board and ſquared Timber may be r
ſolved by Multiplication, or uſing the Ta
of Logarithmes by Addition.

A two-foot Rule, as hath been ſaid, is
ſually ſubdivided into 24 inches, each in
into 4 quarters, and each quarter into
half quarters; but each foot may as eaſi
and a great deal more commodiouſly be
vided into ten equal parts, and then each
thoſe into ten other equal parts; (and e
of thoſe into ten other equal parts (or
leaſt ſuch diviſion muſt be ſuppoſed or i
gined when it cannot be actually made)
Rule ſo divided being applied to the ſide
ſuperficial figures, or of ſolid bodies will
firſt ſight give the quantities of the L
feet and decimal parts of a foot (as rea
as a foot vulgarly divided will ſhew

many feet, inches, quarters, and half quarters are contained in any line) from whence the superficial or solid content may be found in feet by Multiplication, only as hath been said, and that with much more ease than in the vulgar way, as I shall partly manifest by some examples; but first I will shew how the Tables by which the Lines of Board and Timber measure are set upon the Carpenters Rule, may be computed by the following Propositions.

Proposition 1.

The breadth of a long square being given in inch measure, to find the length of a superficial foot in the same measure.

As the breadth given, is to 12 inches or a foot in breadth, so is 12 inches or a foot in length, to the length required.

Or thus.

As the breadth given, is to 144 inches the quantity of a superficial foot, so is 12 inches to the length required. And therefore 144 inches being divided by the breadth given, the quotient shall be the length required.

Example. Let the breadth of a board be 5 inches, and you would know how much of that board in length will make a foot, or 144 square inches, divide 144 by 5, the quotient is 28 $\frac{4}{5}$ inches, that is 28 inches

3 quarters 1 $\frac{1}{4}$, and ſo much in length will make a foot of Board, for 28 $\frac{8}{9}$ being multiplied by 5 the product will be 144.

In like manner, if the breadth of a board given be 15 inches 11 $\frac{1}{4}$ of an inch will make a foot of board, and ſo of any other.

Propoſition 2.

The breadth and depth of a piece of Timber being given, to find how much in length will make a foot.

Multiply the breadth by the depth, and divide 1728 (the number of cubick inches in a foot) by the product the quotient ſhall be the length required.

Example. Let the breadth of a piece of Timber be 17 inches, and the depth 9, the product of theſe two is 153; now then if you divide 1728 by 153, the quotient will be 11, 2941, that is 11 inches $\frac{1}{3}$, and ſomewhat more.

2. *Example.* Let the breadth of a piece of Timber be 7 inches, and the depth as much, the product of 7 by 7 is 49. Now then, if you divide 1728 by 49, the quotient is 35 inches 35, 65, that is 2 foot 11 inches $\frac{1}{3}$, and ſomewhat more; And in this manner if you divide 1728 by the ſquare of any number of inches, ſo ſhall the quotient give you the length required; and this ſhall ſuffice to be ſaid of the Conſtruction and Uſe of the ordinary Carpenters Rule.

CHAP.

Chap. II.

Of the Measuring of Board and Timber by help of Decimal Fractions, and the Table of Logarithmes.

HAving in the preceding Chapter shewed the construction and use of the Carpenters Rule, I shall now shew you how any flat or regular solid may be more readily, and as unto solids more exactly measured, than by the Line of Timber measure already mentioned, for indeed that Line doth properly serve for square measure only, and the way generally used for round or unequal sided Timber is very erroneous, which is in round Timber to take the fourth part of the girt measure, for one side of the square, and to add the two unequal sides of either Timber together, and to take the half thereof, for the side of that Timber in square measure, but this way is very erroneous, as will appear by this example; in an unequal sided piece of Timber, let the depth be 15 inches, and the breadth but 9, the sum of these two sides, do together make 24 inches, and the half thereof is 12 inches or a foot, and therefore by this rule one foot in length should make a foot of Timber; but for as much as there ought to be 12 foot of Board

in a foot of Timber, if one inch of that Timber will not make a foot of Board, 12 inches cannot make a foot of Timber; now then if you multiply 15 by 9, the product 135 doth want 9 inches of 144, the number of inches in a foot of Board, and 12 times 9, or 108 inches will be wanting of a foot of Timber, if 12 inches in length of that piece be taken for a foot; and this is sufficient to demonstrate the insufficiency of that line commonly used, and the error thereof in measuring of unequal sided Timber, as it is commonly used: But if your rule be decimally divided, as hath been already said, the content of any flat or solid may be found by Multiplication of the dimensions given, or by the Addition of the Logarithmes of those dimensions, as by the Propositions following doth appear.

Proposition. 1.

The length and breadth of a Board, or other flat measure being given in foot measure, to find the content in feet.

The proportion is, As 1. is to the breadth in foot measure; so is the length in foot measure to the Content.

Example. Let the length of a Board be 17,63 that is 17 foot, and 63 hundred parts of a foot, and let the breadth be 2,36, that is 2 foot and 36 hundred parts of a foot, and let the length be sought.

Multiply

Multiply 17,63 by 2,36 as in ordinary Multiplication, the product will be 416068, from which if you cut off 4 figures, because there are 4 figures of parts in both numbers, and so the content of the Board is 41,6068, that is 41 foot, and 6068 ten thousand parts of a foot.

By Logarithmes the content of this Board is thus found, the Logarithme of 17, 63 is 1,246252, and the Logarithme of 2, 36 is 0, 372912, the sum of these two Logarithmes is 1, 619164, and the absolute number answering thereunto is 41, 606, that is 41 foot, and 606 thousand parts of a foot, as before.

As 1	0,000000
Is to the length 17, 63	1,246252
So is the breadth 2,36	0,372912
To the content 41, 606	1,619164

This one example well considered, will be sufficient light for the understanding of all the rest.

Proposition 2.

The Circumference of a circle being given to find the superficial content.

As 1, is to .079578 so is the square of the circumference, to the superficial content.

Example.

Example.

Let the Circumference of a circle be 8 foot, & 63 parts of a foot. I say *Comparithme.*

As 1. is to .079578	1,990700
So is the square of 8,63	0,936011
	0,936011
To the superficial content 5,9254.	0,772722

Proposition 3.

The circumference of a Circle being given, to find the side of the square, which may be inscribed within the same circle.

As 1. is to .225078, so is the circumference to the side inquired.

Example:

As 1. Is to .225078	9,352335
So is the circumference 8,63	0,936011
To the side required 1,9424	0,288346

Proposition 4.

The length, breadth and depth of a piece of Timber being given to find the content.

Multiply the breadth by the depth, and the product by the length, the last product shall be the content.

Example:

Example.

Let the breadth be	2,34	0,369216
The depth	1,61	0,206826
The length	17,58	1,245019
The content	66,231	1,821061

Proposition 5.

The base and length of a Cylinder being given to find the content.

Multiply the base by the length, the product is the content required.

Example.

Let the base of a Cylinder, which is the superficial content of a circle be 5,9254, and the length 27 foot 47 parts of a foot.

As 1. Is to	5,9254	0,772722
So is the length	27,47	1,438859
To the content	162,77	2,211581

Proposition 6.

The two bases of an irregular solid, being given; to find the solid content thereof.

Although there be infinite varieties of irregular solids, yet I here call them only irregular, which being considered longwise are straight, and have one base greater than the other, to find the content of such solids this is the rule.

Multiply

Multiply the greater base by the less, and of that product extract the square root, this done, if by the aggregate of that root, and both the bases, you multiply the third part of the length of the solid propounded, the last product is the solid content required.

Let the given length be 15, 24, the third part is 5, 08.

The greater base	1,92	0,283301
The lesser base	85	9,929419
The product.	1,6320	0,212720
The square root	1,2775	0,106360
The greater base	1,92	
The lesser base	85	
The root found	1,2775	
The Aggregate	4,0475	0,607187
⅓ of the length	5,08	0,705864
The solid content	20,561	1,313051

CHAP. III.

Containing the Construction and Use of two Rods for the Gangeing of Cask.

THE Gangeing of Cask or Vessels for Wine and Ale, or such like, dependeth upon one of these two, *viz.* either the finding

of

a mean Diameter between the Diameter the head, and the Diameter at the Bung; finding a proportion between the contents of the two Cylenders at the head and ung of the veſſel.

For the firſt of theſe, the finding of a mean ameter between the Diameter taken at head and bung, Mr. *Wingate* hath ſtated proportion between the two Diameters, be as 10 to 7, and ſo æquates the Diaeter by adding the proportional part of difference to the leſſer Diameter. For ample: The Diameter at the head being ,3 inches, and that at the bung 21, 5 hes, the difference between theſe two , 2.

Now then, As 10 to 7: So is 3,2 to 2,24. therefore 2,24 being added to 18, 3 the the æquated Diameter is 20, 54. And the more ready finding of this proportial part, he hath contrived two Scales of inches in length a piece to face one anoer, one of them being divided into 7 ual parts, and each of theſe into 10; the oer is divided into 10 equal parts, and each thoſe are ſubdivided into ten more leſſer rts; from which ſcales thus divided, he finds part proportional in this manner; having nd the difference between the two iameters, he counteth the ſame upon the ale of 7 inches divided into 100 parts, nd the inches and parts in the ſcale of

whole

whole inches, answering to those inches and parts in the lesser scale, being added to the lesser Diameter, will give the æquated Diameter as before.

Or thus, your Gauge-Rod being 3 foot in length hath four scales described upon it: the first is an ordinary scale of inches numbred by the figures 1,2,3,4, &c. to 36, and every inch divided into ten parts, after the usual manner, which ten parts are for distinction sake called Tenths.

The second is another scale of equal parts thus framed, *viz.* by dividing each seaven inches into ten equal parts, until that whole scale be so divided; and that done, it seems to be nothing else, but another scale of inches of a lesser volume, and without figures, and each of those little inches again subdivided into lesser parts, in like sort, as that other scale of inches is subdivided. And therefore the difference between the two Diameters being accounted upwards from the lesser Diameter in the scale of small inches, will give the æquated Diameter in the scale of great inches.

The third is a scale of Wine measure first divided into great parts, representing Wine Gallons, and distinguished by the larger figures, 1, 2, 3, 4, &c. And then each of those great parts (or Wine Gallons) are subdivided into ten lesser parts representing the Decimal parts of a Wine gallon; and each of these subdivided

again into as many parts as quantity will permit.

The fourth and laſt is a Scale of Ale-meaſure, divided into Ale-gallons, and afterwards ſubdivided into Decimal parts of an Ale-gallon, as that of Wine-meaſure is ſubdivided.

The Scales of Ale and Wine-meaſure are thus to be made. 1. Firſt you muſt find the Gauge-point or Diameter of that circle, whoſe ſuperficial content is equal to the ſolid content of the meaſure propounded: Thus the Gauge-point for Wine-meaſure, is the Diameter of a circle, whoſe ſuperficial content is 231 inches, the number of inches in a Wine-gallon; And the Gauge-point for Ale-meaſure, is the Diameter of a circle, whoſe ſuperficial content is equal to the number of cubick inches in an Ale-gallon; this ſome would have to be 272, 25, others 288, others again ſay, that the Ale-gallon containeth 282 cubick inches, amongſt ſuch variety, the Statute not giving ſufficient directions, I know not what to determine, but muſt leave it to thoſe in Authority, if any controverſie ſhall ariſe about it: according to theſe or any other proportionals the Gauge-point may be found by this manner, by the 7. Propoſition of the 9 chapter of my *Mathem. Elements*. As 1. is to 1, 27324. ſo is the ſuperficial content of the circle given, to the ſquare of that Diameter which is required. And

And thus the Gauge-point, or Diameter of a circle, whose superficial content is 231 cubick inches, or 1 Wine-gallon will be found to be.

As 1,	
Is to 1, 27324	0,104910
So is 231	2,363612
The square of the Diam. 294,11.	2,468522
The Diameter 17, 15. *ferè.*	1,234261

And hence it followeth that a Cylinder having 17, 15 for its Diameter, doth in every inch of the length thereof contain one entire Wine-gallon.

And therefore to find the superficial content of any other circle in Wine-gallons and parts of a gallon.

The Proportion is.

As 1. Is to .78539, so is the square of the Diameter given, to the superficial content required.

And thus if a Diameter of a circle were 18 inches, the superficial content will be found to be 254,47 inches.

As 1. Is to .78539	9,895090
So is the Diameter 18 inches	1,255272
	1,255272
To the content 254,47 *ferè.*	2,405634
which being divided by 231, the number of inches in a Wine-gallon the quot. is	1,1015

The

The Logarithme of 244,47	2,405634
The Logarithme of 231	2,363612
The Quotient 1.1015	0,042012

The like may be done for any other Diameter, and for any other measure; and the Tables for Wine and Ale-measure being thus computed, and set upon the Rod, to find the content of any Vessel, do thus.

Having found the æquated Diameter, the Rod sheweth the Gallons and parts contained in the superficies of that circle, which being multiplied by the length, gives the content. Thus a Vessel being 32 inches long, and the æquated Diameter 18, the superficial content of that circle is 1,1015. which being multiplied by 32, the content of the Vessel, will be found to be 35, 248 parts of a gallon.

But if the content be required, by help of the Gauge point, the proportion is.

As the square of the Gauge-point 17,15.
Is to the square of the Diameter given.
So is the length given, unto the content required.

The Logarithme of 17,15	1,234261
The Logarithme of the square	2,468522
The Logarithme of 18	1,255272
The Logarithme of the square	2,510544
The Logarithme of 32	1,505150

Their sum is	4,015694
The Logarithme of the square of 17,15.	2,468522
Their difference	1,547172

is the Logarithme of 35, 251, the content of the Vessel required.

Or thus.

The Logarithme 17, 15	1,234261
The Logarithme of 18	1,255272
Their difference	0,021011
The Logarithme of 32	1,505150
The difference doubled add	0,042022
The content as before	1,547172

And thus the making of the Table, by which the Rod for Wine-measure is composed is made plain.

For as the square of the Gauge-point, 17, 15 is to the superficial content of that circle 1 Gallon.

So is the square of another Diameter to the superficial content of that circle.

And this shall suffice to be spoken of Master *Wingates* way of Gaugeing by equalling of the Diameter.

There is another way of Gaugeing propounded by Mr. *Oughtred* in the 9 Chapter of his Circles of Proportion, and demonstrated by Mr. *Brigges* in the 26 Chapter of

of his *Arithmetica Logarithmica*, and this is by equalling the circles.

The ſuperficial content of all circles under 36 inches Diameter being computed in Wine and Ale-gallons, he ſetteth one third part of thoſe contents upon the Rod, this done to find the content of the Veſſel, Mr. *Brigges* directeth thus.

Take the difference between the contents of the two Circles anſwering to the Diameters of the head and bung; one third part of that difference being ſubſtracted from the greater Cylinder, or two thirds of that difference being added to the leſſer, the ſum or remainder being multiplied by the length ſhall give the content.

Example.

The content of a Circle, whoſe Diameter is 21,5 is	1,5716
18,3 is	1,1386
Their difference is	.4330
$\frac{1}{3}$ of that difference is	.1443
Two thirds is	.2887

The greater Circ.	1,5716.	the leſſer	1,1386
$\frac{1}{3}$ Subſt. ——	0,1443.	$\frac{2}{3}$ add. ——	2887
Difference	1,4273.	ſum.	1,4273

Or thus according to Mr. *Oughtred*,

Take two thirds of the great circle 1,0478
$\frac{1}{2}$ of the leſſer, *viz.* 0,3795.
Then the ſum is the content as before $\frac{2}{3}$ 1,4273
which being multiplied by the length will gain the content. And this I judg ſufficient for the explanation of the two beſt and moſt general received wayes of Gauging, and leave it to the diſcretion of the Ingenious Artiſt, to take that which ſuteth beſt with his own liking.

Soli Deo Gloria.

FINIS.

CHILIADES
DECEM
Logarithmorum,

Pro numeris naturali serie crescentibus ab unitate ad 10000.

Quorum ope, Tabulæ partium proportionalium annexæ, omnium numerorum usque ad 100.000 inveniantur.

N.	0	1	2	3	4
0	0.000000	0.000000	0.301030	0.477121	0.602060
1	1.000000	1.041393	1.079181	1.113943	1.146128
2	1.301030	1.322219	1.342423	1.361728	1.380211
3	1.477121	1.491362	1.505150	1.518514	1.531479
4	1.602060	1.612784	1.623249	1.633468	1.643453
5	1.698970	1.707570	1.716003	1.724276	1.732394
6	1.778151	1.785330	1.792392	1.799341	1.806180
7	1.845098	1.851258	1.857332	1.863323	1.869232
8	1.903090	1.908485	1.913814	1.919078	1.924279
9	1.954242	1.959041	1.963788	1.968483	1.973128
10	2.000000	2.004321	2.008600	2.012837	2.017033
11	2.041393	2.045323	2.049218	2.053078	2.056905
12	2.079181	2.082785	2.086360	2.089905	2.093422
13	2.113943	2.117271	2.120574	2.123852	2.127105
14	2.146128	2.149219	2.152288	2.155336	2.158362
15	2.176091	2.178977	2.181844	2.184691	2.187521
16	2.204120	2.206826	2.209515	2.212188	2.214844
17	2.230449	2.232996	2.235528	2.238046	2.240549
18	2.255272	2.257679	2.260071	2.262451	2.264819
19	2.278754	2.281033	2.283301	2.285557	2.287802
20	2.301030	2.303196	2.305351	2.307496	2.309630
21	2.322219	2.324282	2.326336	2.328380	2.330414
22	2.342423	2.344392	2.346353	2.348305	2.350248
23	2.361728	2.363612	2.365488	2.367356	2.369216
24	2.380211	2.382017	2.383815	2.385606	2.387390
25	2.397940	2.399674	2.401401	2.403121	2.404834
26	2.414973	2.416641	2.418301	2.419956	2.421604
27	2.431364	2.432969	2.434569	2.436163	2.437751
28	2.447158	2.448706	2.450249	2.451786	2.453318
29	2.462398	2.463893	2.465383	2.466868	2.468347
30	2.477121	2.478566	2.480007	2.481443	2.482874
31	2.491362	2.492760	2.494155	2.495544	2.496930
32	2.505150	2.506505	2.507856	2.509203	2.510545
33	2.518514	2.519828	2.521138	2.522444	2.523746
34	2.531479	2.532754	2.534026	2.535294	2.536558
35	2.544068	2.545307	2.546543	2.547775	2.549003
36	2.556302	2.557507	2.558709	2.559907	2.561101
37	2.568202	2.569374	2.570543	2.571709	2.572872
38	2.579783	2.580925	2.582063	2.583199	2.584331
39	2.591065	2.592177	2.593286	2.594393	2.595496

5	6	7	8	9
0.698970	0.778151	0.845098	0.903090	0.954242
1.176091	1.204120	1.230449	1.255272	1.278754
1.397940	1.414973	1.431364	1.447158	1.462398
1.544068	1.556303	1.568202	1.579784	1.591065
1.653213	1.662758	1.672098	1.681241	1.690196
1.740363	1.748188	1.755875	1.763428	1.770852
1.812913	1.819544	1.826075	1.832509	1.838849
1.875061	1.880814	1.886491	1.892095	1.897627
1.929419	1.934498	1.939519	1.944483	1.949390
1.977724	1.982271	1.986772	1.991226	1.995635
2.021189	2.025306	2.029384	2.033424	2.037426
2.060698	2.064458	2.068186	2.071882	2.075547
2.096910	2.100371	2.103804	2.107210	2.110590
2.130334	2.133539	2.136721	2.139879	2.143015
2.161368	2.164353	2.167317	2.170262	2.173186
2.190332	2.193125	2.195900	2.198658	2.201397
2.217484	2.220108	2.222716	2.225309	2.227887
2.243038	2.245513	2.247973	2.250420	2.252853
2.267172	2.269513	2.271842	2.274158	2.276462
2.290035	2.292256	2.294466	2.296665	2.298853
2.311754	2.313867	2.315970	2.318063	2.320146
2.332438	2.334454	2.336460	2.338456	2.340444
2.352183	2.354108	2.356026	2.357935	2.359835
2.371068	2.372912	2.374748	2.376577	2.378398
2.389166	2.390935	2.392697	2.394452	2.396199
2.406540	2.408240	2.409933	2.411620	2.413300
2.423246	2.424882	2.426511	2.428185	2.429752
2.439333	2.440909	2.442480	2.444045	2.445604
2.454845	2.456366	2.457882	2.459392	2.460898
2.469822	2.471292	2.472756	2.474216	2.475671
2.484300	2.485721	2.487138	2.488551	2.489958
2.498311	2.499687	2.501059	2.502427	2.503791
2.511883	2.513218	2.514550	2.515874	2.517196
2.525045	2.526339	2.527630	2.528917	2.530200
2.537819	2.539076	2.540329	2.541579	2.542825
2.550228	2.551450	2.552668	2.553883	2.555094
2.562293	2.563481	2.564666	2.565848	2.567026
2.574031	2.575188	2.576341	2.577492	2.578639
2.585461	2.586587	2.587711	2.588832	2.589950
2.596597	2.597695	2.598791	2.599883	2.600973

N.	0	1	2	3	4
40	2.602060	2.603144	2.604226	2.605305	2.606381
41	2.612784	2.613842	2.614897	2.615950	2.617000
42	2.623249	2.624282	2.625312	2.626340	2.627366
43	2.633468	2.634477	2.635484	2.636488	2.637490
44	2.643453	2.644439	2.645422	2.646404	2.647383
45	2.653212	2.654177	2.655138	2.656098	2.657056
46	2.662758	2.663701	2.664642	2.665581	2.666518
47	2.672098	2.673121	2.673942	2.674801	2.675778
48	2.681241	2.682145	2.683047	2.683947	2.684845
49	2.690196	2.691081	2.691965	2.692847	2.693727
50	2.698970	2.699838	2.700704	2.701568	2.702431
51	2.707570	2.708421	2.709270	2.710117	2.710963
52	2.716003	2.716838	2.717670	2.718502	2.719331
53	2.724276	2.725095	2.725912	2.726727	2.727541
54	2.732394	2.733197	2.733999	2.734800	2.735599
55	2.740363	2.741152	2.741939	2.742725	2.743510
56	2.748188	2.748963	2.749736	2.750508	2.751279
57	2.755875	2.756636	2.757396	2.758155	2.758912
58	2.763428	2.764176	2.764923	2.765669	2.766413
59	2.770852	2.771587	2.772321	2.773055	2.773786
60	2.778151	2.778874	2.779596	2.780317	2.781037
61	2.785330	2.786041	2.786751	2.787460	2.788168
62	2.792392	2.793092	2.793790	2.794488	2.795185
63	2.799341	2.800029	2.800717	2.801404	2.802089
64	2.806180	2.806858	2.807535	2.808211	2.808886
65	2.812913	2.813581	2.814248	2.814913	2.815578
66	2.819544	2.820211	2.820858	2.821514	2.822168
67	2.826075	2.826723	2.827369	2.828015	2.828660
68	2.832509	2.833147	2.833784	2.834421	2.835056
69	2.838849	2.839478	2.840106	2.840732	2.841359
70	2.845098	2.845718	2.846337	2.846955	2.847573
71	2.851258	2.851870	2.852480	2.853090	2.853698
72	2.857332	2.857935	2.858537	2.859138	2.859739
73	2.863323	2.863917	2.864511	2.865104	2.865696
74	2.869232	2.869818	2.870404	2.870989	2.871573
75	2.875061	2.875640	2.876218	2.876795	2.877371
76	2.880814	2.881385	2.881955	2.882525	2.883093
77	2.886491	2.887054	2.887617	2.888179	2.888741
78	2.892095	2.892651	2.893207	2.893762	2.894316
79	2.897627	2.898176	2.898725	2.899273	2.899821

2.607155	2.608526	2.609594	2.610660	2.611723
2.618048	2.619093	2.620136	2.621176	2.622214
2.628389	2.629410	2.630428	2.631444	2.632457
2.638449	2.639486	2.640481	2.641474	2.642464
2.648360	2.649335	2.650308	2.651278	2.652246
2.658011	2.658965	2.659916	2.660865	2.661813
2.667453	2.668386	2.669317	2.670246	2.671173
2.676694	2.677607	2.678518	2.679428	2.680336
2.685742	2.686636	2.687529	2.688420	2.689309
2.694605	2.695482	2.696356	2.697229	2.698101
2.703291	2.704151	2.705008	2.705864	2.706718
2.711807	2.712650	2.713491	2.714330	2.715167
2.720159	2.720986	2.721811	2.722634	2.723456
2.728354	2.729165	2.729974	2.730782	2.731589
2.736397	2.737192	2.737987	2.738780	2.739572
2.744293	2.745075	2.745855	2.746634	2.747412
2.752048	2.752816	2.753583	2.754348	2.755112
2.759668	2.760422	2.761176	2.761928	2.762679
2.767158	2.767898	2.768638	2.769377	2.770115
2.774517	2.775246	2.775974	2.776701	2.777427
2.781755	2.782473	2.783189	2.789304	2.784617
2.788875	2.789521	2.790285	2.790988	2.791691
2.795880	2.796574	2.797268	2.797960	2.798651
2.802774	2.803457	2.804139	2.804821	2.805501
2.809560	2.810231	2.810994	2.811575	2.812245
2.816241	2.816904	2.817565	2.818226	2.818885
2.822822	2.823474	2.824126	2.824776	2.825426
2.829304	2.829947	2.830589	2.831230	2.831870
2.835691	2.836324	2.836957	2.837588	2.838219
2.841985	2.842609	2.843233	2.843855	2.844477
2.848189	2.848805	2.849419	2.850033	2.850646
2.854306	2.854913	2.855519	2.856124	2.856729
2.860338	2.860937	2.861534	2.862131	2.862728
2.866287	2.866878	2.867467	2.868056	2.868644
2.872156	2.872739	2.873321	2.873902	2.874482
2.877947	2.878522	2.879096	2.879669	2.880242
2.883661	2.884229	2.884795	2.885361	2.885926
2.889302	2.889862	2.890421	2.890980	2.891537
2.894870	2.895423	2.895975	2.896526	2.897077
2.900367	2.900913	2.901458	2.902002	2.902547

N.	0	1	2	3	4
80	2.903089	2.903633	2.904174	2.904716	2.905256
81	2.908485	2.909021	2.909556	2.910091	2.910624
82	2.913814	2.914343	2.914872	2.915400	2.915927
83	2.919078	2.919601	2.920134	2.920645	2.921166
84	2.924279	2.924796	2.925312	2.925828	2.926342
85	2.929419	2.929930	2.930440	2.930949	2.931458
86	2.934493	2.935003	2.935507	2.936011	2.936514
87	2.939519	2.940018	2.940516	2.941014	2.941511
88	2.944483	2.944976	2.945469	2.945961	2.946452
89	2.949390	2.949878	2.950365	2.950851	2.951338
90	2.954242	2.954725	2.955207	2.955688	2.956168
91	2.959041	2.959518	2.959995	2.960471	2.960946
92	2.963788	2.964260	2.964731	2.965202	2.965672
93	2.968483	2.968950	2.969416	2.969882	2.970347
94	2.973128	2.973590	2.974051	2.974512	2.974972
95	2.977724	2.978181	2.978637	2.979093	2.979548
96	2.982271	2.982723	2.983175	2.983626	2.994077
97	2.986772	2.987219	2.987666	2.988113	2.988559
98	2.991226	2.991669	2.992111	2.992554	2.992995
90	2.995635	2.996074	2.996512	2.996949	2.997386
100	3.000000	3.000434	3.000868	3.001301	3.001734
101	3.004321	3.004751	3.005181	3.005609	3.006038
102	3.008600	3.009026	3.009451	3.009876	3.010299
103	3.012837	3.013259	3.013679	3.014100	3.014521
104	3.017003	3.017451	3.017868	3.018284	3.018700
105	3.021189	3.021603	3.022016	3.022428	3.022841
106	3.025306	3.025715	3.026125	3.026533	3.026942
107	3.029384	3.029789	3.030195	3.030599	3.031004
108	3.033424	3.033826	3.034227	3.034628	3.035029
109	3.037426	3.037825	3.038223	3.038620	3.039017
110	3.041393	3.041787	3.042182	3.042576	3.042969
111	3.045323	3.045714	3.046105	3.046495	3.046885
112	3.049218	3.049603	3.049993	3.050379	3.050766
113	3.053078	3.053466	3.053846	3.054229	3.054613
114	3.056905	3.057283	3.057666	3.058046	3.058426
115	3.060698	3.061075	3.061451	3.061829	3.062204
116	3.064458	3.064832	3.065206	3.065579	3.065953
117	3.068186	3.068557	3.068928	3.069298	3.069668
118	3.071882	3.072249	3.072617	3.072985	3.073351
119	3.075547	3.075912	3.076276	3.076640	3.077004

5	6	7	8	9	D.
2.905796	2.906335	2.906874	2.907410	2.907949	
2.911158	2.911690	2.912222	2.912753	2.913284	
2.916454	2.916980	2.917586	2.918030	2.918555	
2.921686	2.922206	2.922725	2.923244	2.923762	
2.926857	2.927370	2.927883	2.928396	2.928908	
2.931966	2.933474	2.932981	2.933487	2.933993	
2.937016	2.937518	2.938019	2.938520	2.939020	
2.942008	2.942504	2.943000	2.943495	2.943989	
2.946943	2.947434	2.947924	2.948413	2.948902	
2.951823	2.952308	2.952792	2.953276	2.953760	
2.956649	2.957128	2.957607	2.958086	2.958564	
2.961421	2.961895	2.962369	2.962843	2.963316	
2.966142	2.966611	2.967080	2.967548	2.968016	
2.970812	2.971276	2.971740	2.972203	2.972666	
2.975432	2.975891	2.976350	2.976808	2.977266	
2.980003	2.980458	2.980912	2.981366	2.981819	
2.984527	2.984977	2.985426	2.985875	2.986324	
2.989005	2.989450	2.989895	2.990339	2.990783	
2.993436	2.993877	2.994317	2.994757	2.995196	
2.997823	2.998259	2.998695	2.999131	2.999565	
3.002166	3.002598	3.003029	3.003461	3.003891	432
3.006466	3.006894	3.007321	3.007748	3.008174	428
3.010724	3.011147	3.011570	3.011993	3.012415	424
3.014940	3.015359	3.015779	3.016197	3.016616	419
3.019116	3.019532	3.019947	3.020361	3.020775	416
3.023252	3.023664	3.024075	3.024486	3.024896	412
3.027349	3.027757	3.028164	3.028571	3.028978	408
3.031408	3.031812	3.032216	3.032619	3.033021	404
3.035429	3.035821	3.036229	3.036629	3.037028	400
3.039414	3.039811	3.040207	3.040602	3.040998	396
3.043362	3.043755	3.044148	3.044539	3.044932	393
3.047275	3.047664	3.048053	3.048442	3.048830	389
3.051153	3.051538	3.051924	3.052309	3.052694	386
3.054996	3.055378	3.055760	3.056142	3.056524	382
3.058805	3.059185	3.059562	3.059942	3.060320	379
3.062582	3.062958	3.063333	3.063709	3.064083	376
3.066326	3.066699	3.067071	3.067443	3.067815	372
3.070038	3.070407	3.070776	3.071145	3.071514	369
3.073718	3.074085	3.074451	3.074818	3.075182	366
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	363

N.	0	1	2	3	4
120	3.079181	3.079543	3.079904	3.080266	3.080626
121	3.082785	3.083144	3.083503	3.083861	3.084219
122	3.086359	3.086716	3.087071	3.087426	3.087781
123	3.089905	3.090258	3.090610	3.090963	3.091315
124	3.093422	3.093772	3.094122	3.094471	3.094820
125	3.096910	3.097257	3.097604	3.097951	3.098298
126	3.100371	3.100715	3.101059	3.101403	3.101747
127	3.103804	3.104146	3.104487	3.104828	3.105169
128	3.107209	3.107549	3.107888	3.108227	3.108565
129	3.110589	3.110926	3.111263	3.111599	3.111934
130	3.113943	3.114277	3.114611	3.114944	3.115278
131	3.117271	3.117603	3.117934	3.118265	3.118595
132	3.120574	3.120903	3.121231	3.121559	3.121888
133	3.123852	3.124178	3.124504	3.124830	3.125156
134	3.127105	3.127429	3.127753	3.128076	3.128399
135	3.130334	3.130655	3.130977	3.131298	3.131619
136	3.133539	3.133858	3.134177	3.134496	3.134814
137	3.136721	3.137037	3.137354	3.137671	3.137987
138	3.139879	3.140194	3.140508	3.140822	3.141136
139	3.143015	3.143327	3.143639	3.143951	3.144263
140	3.146128	3.146438	3.146748	3.147058	3.147367
141	3.149219	3.149527	3.149835	3.150142	3.150449
142	3.152288	3.152594	3.152899	3.153205	3.153509
143	3.155336	3.155639	3.155943	3.156246	3.156549
144	3.158362	3.158664	3.158965	3.159266	3.159567
145	3.161368	3.161667	3.161967	3.162266	3.162564
146	3.164353	3.164650	3.164947	3.165244	3.165541
147	3.167317	3.167613	3.167908	3.168203	3.168497
148	3.170262	3.170555	3.170848	3.171141	3.171434
149	3.173186	3.173478	3.173769	3.174059	3.174351
150	3.176091	3.176381	3.176669	3.176959	3.177248
151	3.178977	3.179264	3.179552	3.179839	3.180126
152	3.181844	3.182129	3.182415	3.182699	3.182985
153	3.184691	3.184975	3.185259	3.185542	3.185825
154	3.187521	3.187803	3.188084	3.188366	3.188647
155	3.190332	3.190612	3.190892	3.191171	3.191451
156	3.193125	3.193403	3.193681	3.193959	3.194237
157	3.195899	3.196176	3.196453	3.196729	3.197005
158	3.198657	3.198932	3.199206	3.199481	3.199755
159	3.201397	3.201670	3.201943	3.202216	3.202488

5	6	7	8	9	D
3.080987	3.081347	3.081707	3.082067	3.082426	360
3.084576	3.084934	3.085291	3.085647	3.086004	357
3.088136	3.088490	3.088845	3.089198	3.089552	355
3.091667	3.092018	3.092369	3.092721	3.093071	351
3.095169	3.095518	3.095886	3.096215	3.096562	349
3.098644	3.098989	3.099335	3.099681	3.100026	346
3.102091	3.102434	3.102777	3.103119	3.103462	343
3.105510	3.105851	3.106191	3.106[illegible]	[illegible]06871	340
3.108903	3.109241	3.109579	3.109[illegible]	[illegible]0253	338
3.112269	3.112605	3.112939	3.113[illegible]	[illegible]3609	336
3.115611	3.115943	3.116276	3.116608	3.116939	333
3.118926	3.119256	3.119586	3.119915	3.120245	330
3.122216	3.122544	3.122871	3.123198	3.123525	328
3.125481	3.125806	3.126131	3.126456	3.126781	325
3.128722	3.129045	3.129368	3.129689	3.130012	323
3.131939	3.132259	3.132579	3.132899	3.133219	321
3.135133	3.135451	3.135769	3.136086	3.136403	318
3.138303	3.138618	3.138934	3.139249	3.139564	315
3.141449	3.141763	3.142076	3.142389	3.142702	314
3.144574	3.144885	3.145196	3.145507	3.145818	311
3.147676	3.147985	3.148294	3.148603	3.148911	309
3.150756	3.151063	3.151369	3.151676	3.151932	307
3.153815	3.154119	3.154423	3.154728	3.155032	305
3.156852	3.157154	3.157457	3.157759	3.158061	303
3.159868	3.160168	3.160469	3.160769	3.161068	301
3.162863	3.163161	3.163459	3.163758	3.164055	299
3.165838	3.166134	3.166430	3.166726	3.167022	297
3.168792	3.169086	3.169380	3.169674	3.169968	295
3.171726	3.172019	3.172311	3.172603	3.172895	293
3.174641	3.174932	3.175223	3.175513	3.175801	291
3.177536	3.177825	3.178113	3.178401	3.178689	289
3.180413	3.180699	3.180986	3.181272	3.181558	287
3.183269	3.183555	3.183839	3.184123	3.184407	285
3.186108	3.186391	3.186674	3.186956	3.187239	283
3.188918	3.189209	3.189487	3.189771	3.190051	281
3.191730	3.192009	3.192289	3.192567	3.192846	279
3.194514	3.194792	3.195069	3.195346	3.195623	278
3.197283	3.197556	3.197833	3.198107	3.198382	276
3.200029	3.200303	3.200577	3.200850	3.201124	274
3.202761	3.203033	3.203305	3.203577	3.203848	272

N.	0	1	2	3	4
160	3.204119	3.204391	3.204663	3.204934	3.205204
161	3.206826	3.207096	3.207365	3.207364	3.207904
162	3.209513	3.209783	3.210051	3.210319	3.210586
163	3.212187	3.212454	3.212720	3.212986	3.213252
164	3.214844	3.215109	3.215373	3.215638	3.215902
165	3.217484	3.217747	3.218010	3.218273	3.218536
166	3.220115	3.220369	3.220631	3.220892	3.221153
167	3.222715	3.222976	3.223236	3.223496	3.223755
168	3.225314	3.225568	3.225826	3.226084	3.226342
169	3.227872	3.228142	3.228400	3.228657	3.228913
170	3.230449	3.230704	3.230959	3.231215	3.231469
171	3.232996	3.233250	3.233504	3.233757	3.234011
172	3.235528	3.235781	3.236033	3.236285	3.236537
173	3.238046	3.238297	3.238548	3.238799	3.239049
174	3.240549	3.240799	3.241048	3.241297	3.241546
175	3.243038	3.243286	3.243534	3.243782	3.244029
176	3.245513	3.245759	3.246006	3.246252	3.246499
177	3.247975	3.248219	3.248464	3.248709	3.248954
178	3.250420	3.250664	3.250908	3.251151	3.251395
179	3.252852	3.253096	3.253334	3.253580	3.253822
180	3.255273	3.255514	3.255755	3.255998	3.256237
181	3.257679	3.257918	3.258158	3.258398	3.258637
182	3.260071	3.260309	3.260548	3.260787	3.261025
183	3.262451	3.262688	3.262925	3.263162	3.263399
184	3.264818	3.265054	3.265289	3.265525	3.265761
185	3.267172	3.267406	3.267641	3.267875	3.268109
186	3.269513	3.269746	3.269979	3.270213	3.270446
187	3.271842	3.272074	3.272306	3.272538	3.272769
188	3.274158	3.274389	3.274619	3.274850	3.275081
189	3.276462	3.276692	3.276921	3.277151	3.277379
190	3.278754	3.278982	3.279211	3.279439	3.279667
191	3.281033	3.281261	3.281488	3.281714	3.281941
192	3.283301	3.283527	3.283753	3.283979	3.284205
193	3.285557	3.285782	3.286007	3.286232	3.286456
194	3.287802	3.288026	3.288249	3.288473	3.288696
195	3.290035	3.290257	3.290479	3.290701	3.290925
196	3.292256	3.292478	3.292699	3.292920	3.293141
197	3.294466	3.294687	3.294907	3.295127	3.295347
198	3.296665	3.296884	3.297104	3.297323	3.297542
199	3.298853	3.299072	3.299289	3.299507	3.299725

5	16	17	18	19	D.
3.205475	3.205746	3.206016	3.206286	3.206556	271
3.208173	3.208441	3.208710	3.208978	3.209247	269
3.210853	3.211121	3.211388	3.211654	3.211921	267
3.213518	3.213783	3.214049	3.214314	3.214579	266
3.216166	3.216429	3.216694	3.216957	3.217221	264
3.218798	3.219060	3.219323	3.219585	3.219846	262
3.221414	3.221675	3.221936	3.222196	3.222456	261
3.224015	3.224274	3.224533	3.224791	3.225051	259
3.226599	3.226858	3.227115	3.227372	3.227629	258
3.229169	3.229426	3.229682	3.229938	3.230193	256
3.231724	3.231979	3.232234	3.232488	3.232742	254
3.234264	3.234517	3.234770	3.235023	3.235276	253
3.236789	3.237041	3.237292	3.237544	3.237795	252
3.239299	3.239549	3.239799	3.240049	3.240299	250
3.241795	3.242044	3.242293	3.242541	3.242789	249
3.244277	3.244525	3.244772	3.245019	3.245266	248
3.246745	3.246991	3.247237	3.247482	3.247728	246
3.249198	3.249443	3.249687	3.249932	3.250176	245
3.251638	3.251881	3.252125	3.252368	3.252610	243
3.254064	3.254306	3.254548	3.254789	3.255031	242
3.256477	3.256718	3.256958	3.257198	3.257438	241
3.258877	3.259116	3.259355	3.259594	3.259833	239
3.261263	3.261501	3.261739	3.261976	3.262214	238
3.263366	3.263873	3.264109	3.264346	3.264582	237
3.265996	3.266232	3.266467	3.266701	3.266937	235
3.268344	3.268578	3.268812	3.269046	3.269279	234
3.270679	3.270912	3.271144	3.271377	3.271609	233
3.273001	3.273233	3.273464	3.273696	3.273927	232
3.275311	3.275541	3.275772	3.276002	3.276232	230
3.277609	3.277838	3.278067	3.278296	3.278525	229
3.279895	3.280123	3.280351	3.280578	3.280806	228
3.282169	3.282396	3.282622	3.282849	3.283075	227
3.284431	3.284656	3.284882	3.285107	3.285332	226
3.286681	3.286905	3.287129	3.287354	3.287578	224
3.288919	3.289143	3.289365	3.289589	3.289811	223
3.291148	3.291369	3.291591	3.291813	3.292034	222
3.293368	3.293584	3.293804	3.294025	3.294246	221
3.295577	3.295787	3.296007	3.296226	3.296446	220
3.297782	3.297979	3.298198	3.298416	3.298635	219
3.299971	3.300186	3.300404	3.300621	3.300838	218

N.	0	1	2	3	4
200	3.3010299	3.3012471	3.3014641	3.3016811	3.3018981
201	3.3031496	3.3033412	3.3035628	3.3038441	3.3040259
202	3.3053511	3.3055661	3.3057811	3.3059961	3.3062111
203	3.3074961	3.3077091	3.3079241	3.3081371	3.3083511
204	3.3096630	3.3098431	3.3100561	3.3102681	3.3104811
205	3.3117541	3.3119661	3.3121771	3.3123891	3.3126001
206	3.3138671	3.3140781	3.3142891	3.3144991	3.3147091
207	3.3159701	3.3161801	3.3163891	3.3165991	3.3168091
208	3.3180631	3.3182721	3.3184811	3.3186891	3.3188981
209	3.3201461	3.3203541	3.3205621	3.3207691	3.3209771
210	3.3222191	3.3224261	3.3226331	3.3228391	3.3230461
211	3.3242821	3.3244881	3.3246941	3.3248991	3.3251051
212	3.3263361	3.3265411	3.3267451	3.3269491	3.3271551
213	3.3283791	3.3285831	3.3287871	3.3289911	3.3291941
214	3.3304181	3.3306171	3.3308191	3.3310221	3.3312251
215	3.3324381	3.3326401	3.3328421	3.3330441	3.3332461
216	3.3344541	3.3346551	3.3348561	3.3350571	3.3352571
217	3.3364591	3.3366591	3.3368591	3.3370591	3.3372591
218	3.3384561	3.3386561	3.3388561	3.3390541	3.3392531
219	3.3404481	3.3406421	3.3408411	3.3410391	3.3412371
220	3.3422271	3.3426201	3.3428171	3.3430141	3.3432121
221	3.3443931	3.3445891	3.3447851	3.3449811	3.3451781
222	3.3483531	3.3465491	3.3467441	3.3469391	3.3471351
223	3.3463051	3.3484991	3.3486941	3.3488891	3.3490831
224	3.3502481	3.3504421	3.3506361	3.3508291	3.3510231
225	3.3521831	3.3523751	3.3525681	3.3527611	3.3529541
226	3.3541081	3.3543011	3.3544931	3.3546851	3.3548761
227	3.3560261	3.3562171	3.3564081	3.3565991	3.3567901
228	3.3579351	3.3581251	3.3583161	3.3585061	3.3586961
229	3.3598351	3.3600251	3.3602151	3.3604041	3.3605931
230	3.3617281	3.3619171	3.3621051	3.3622941	3.3624821
231	3.3636121	3.3637991	3.3639881	3.3641751	3.3643631
232	3.3654881	3.3656751	3.3658621	3.3660481	3.3662341
233	3.3673561	3.3675421	3.3677291	3.3679141	3.3681011
234	3.3692161	3.3694011	3.3695871	3.3697721	3.3699581
235	3.3710681	3.3712531	3.3714371	3.3716221	3.3718061
236	3.3729121	3.3730961	3.3732791	3.3734641	3.3736471
237	3.3747481	3.3749321	3.3751151	3.3752981	3.3754811
238	3.3765771	3.3767591	3.3769421	3.3771241	3.3773061
239	3.3783991	3.3785791	3.3787621	3.3789431	3.3791251

5	6	7	8	9	D.
3.302114	3.302331	3.302547	3.302764	3.302979	217
3.304275	3.304491	3.304706	3.304921	3.305136	216
3.306425	3.306639	3.306854	3.307068	3.307282	215
3.308564	3.308778	3.308991	3.309204	3.309417	213
3.310693	3.310906	3.311118	3.311329	3.311542	212
3.312812	3.313023	3.313234	3.313445	3.313656	211
3.314920	3.315130	3.315340	3.315551	3.315760	210
3.317018	3.317227	3.317436	3.317646	3.317854	209
3.319106	3.319314	3.319522	3.319730	3.319938	208
3.321184	3.321391	3.321598	3.321805	3.322012	207
3.323252	3.323458	3.323665	3.323871	3.324077	206
3.325310	3.325516	3.325721	3.325926	3.326131	205
3.327359	3.327563	3.327767	3.327972	3.328176	204
3.329398	3.329601	3.329805	3.330008	3.330211	203
3.331427	3.331629	3.331832	3.332034	3.332236	202
3.333447	3.333649	3.333850	3.334051	3.334253	202
3.335458	3.335658	3.335859	3.336059	3.336259	201
3.337459	3.337659	3.337859	3.338058	3.338257	200
3.339451	3.339650	3.339849	3.340047	3.340246	199
3.341435	3.341632	3.341830	3.342028	3.342225	198
3.343409	3.343606	3.343802	3.343999	3.344196	197
3.345737	3.345569	3.345766	3.345962	3.346157	196
3.347330	3.347525	3.347720	3.347915	3.348110	195
3.349278	3.349472	3.349659	3.349860	3.350054	194
3.351216	3.351409	3.351603	3.351796	3.351989	193
3.353147	3.353339	3.353532	3.353724	3.353916	193
3.355068	3.355259	3.355452	3.355643	3.355834	192
3.356981	3.357172	3.357363	3.357554	3.357744	191
3.358886	3.359076	3.359266	3.359456	3.359646	190
3.360783	3.360972	3.361161	3.361350	3.361539	189
3.362671	3.362859	3.363048	3.363236	3.363424	188
3.364551	3.364739	3.364926	3.365113	3.365301	188
3.366423	3.366609	3.366796	3.366983	3.367169	187
3.368287	3.368473	3.368659	3.368845	3.369030	186
3.370143	3.370328	3.370513	3.370698	3.370882	185
3.371991	3.372175	3.372359	3.372544	3.372728	184
3.373131	3.374015	3.374198	3.374382	3.374568	184
3.375664	3.375846	3.376029	3.376212	3.376394	183
3.377488	3.377670	3.377852	3.378034	3.378216	182
3.379306	3.379487	3.379668	3.379849	3.380030	181

N	0	1	2	3	4
240	3·380211	3·380392	3·380573	3·380754	3·380934
241	3·382017	3·382197	3·382377	3·382557	3·382737
242	3·383815	3·383995	3·384174	3·384353	3·384533
243	3·385606	3·385785	3·385964	3·386142	3·386321
244	3·387389	3·387568	3·387746	3·387923	3·388101
245	3·389166	3·389343	3·389520	3·389698	3·389875
246	3·390935	3·391112	3·391288	3·391464	3·391641
247	3·392697	3·392873	3·393048	3·393224	3·393399
248	3·394452	3·394627	3·394802	3·394977	3·395152
249	3·396199	3·396374	3·396548	3·396722	3·396896
250	3·397940	3·398114	3·398287	3·398461	3·398634
251	3·399674	3·399847	3·400019	3·400192	3·400365
252	3·401401	3·401573	3·401745	3·401917	3·402089
253	3·403121	3·403296	3·403464	3·403635	3·403807
254	3·404834	3·405005	3·405176	3·405346	3·405517
255	3·406540	3·406710	3·406881	3·407051	3·407221
256	3·408239	3·408409	3·408579	3·408749	3·408918
257	3·409933	3·410102	3·410271	3·410439	3·410609
258	3·411619	3·411788	3·411956	3·412124	3·412293
259	3·413299	3·413467	3·413635	3·413803	3·413969
260	3·414973	3·415140	3·415307	3·415474	3·415641
261	3·416641	3·416807	3·416973	3·417139	3·417306
262	3·418301	3·418467	3·418633	3·418798	3·418964
263	3·419956	3·420121	3·420286	3·420451	3·420616
264	3·421604	3·421768	3·421933	3·422097	3·422261
265	3·423246	3·423409	3·423574	3·423737	3·423901
266	3·424882	3·425045	3·425208	3·425371	3·425534
267	3·426511	3·426674	3·426836	3·426999	3·427161
268	3·428135	3·428297	3·428459	3·428621	3·428783
269	3·429752	3·429914	3·430075	3·430236	3·430398
270	3·431364	3·431525	3·431685	3·431846	3·432007
271	3·432969	3·433129	3·433289	3·433449	3·433609
272	3·434569	3·434729	3·434888	3·435048	3·435207
273	3·436163	3·436322	3·436481	3·436639	3·436799
274	3·437751	3·437909	3·438067	3·438226	3·438384
275	3·439333	3·439491	3·439648	3·439806	3·439964
276	3·440909	3·441066	3·441224	3·441381	3·441538
277	3·442479	3·442637	3·442793	3·442949	3·443106
278	3·444045	3·444201	3·444357	3·444513	3·444669
279	3·445604	3·445759	3·445915	3·446071	3·446216

5	6	7	8	9	D.
3.381115	3.381296	3.381476	3.381656	3.381837	181
3.382917	3.383097	3.383277	3.383456	3.383636	180
3.384712	3.384891	3.385069	3.385249	3.385428	179
3.386499	3.386677	3.386856	3.387034	3.387212	178
3.388279	3.388456	3.388634	3.388811	3.388989	178
3.390051	3.390228	3.390405	3.390582	3.390759	177
3.391817	3.391993	3.392169	3.392345	3.392521	176
3.393575	3.393751	3.393926	3.394101	3.394277	176
3.395326	3.395501	3.395676	3.395850	3.396025	175
3.397071	3.397245	3.397419	3.397592	3.397766	174
3.398808	3.398981	3.399154	3.399328	3.399501	173
3.400538	3.400711	3.400883	3.401056	3.401228	173
3.402261	3.402433	3.402605	3.402777	3.402949	172
3.403978	3.404149	3.404320	3.404492	3.404663	171
3.405688	3.405858	3.406029	3.406199	3.406369	171
3.407391	3.407561	3.407731	3.407901	3.408070	170
3.409087	3.409257	3.409426	3.409595	3.409764	169
3.410777	3.410946	3.411114	3.411283	3.411451	169
3.412461	3.412629	3.412796	3.412964	3.413132	168
3.414137	3.414305	3.414472	3.414639	3.414806	167
3.415808	3.415974	3.416141	3.416308	3.416474	167
3.417472	3.417638	3.417804	3.417969	3.418135	166
3.419129	3.419295	3.419460	3.419625	3.419791	165
3.420781	3.420945	3.421110	3.421275	3.421439	165
3.422426	3.422589	3.422754	3.422918	3.423082	164
3.424065	3.424228	3.424392	3.424555	3.424718	164
3.425697	3.425860	3.426023	3.426186	3.426349	163
3.427324	3.427486	3.427648	3.427811	3.427973	162
3.428944	3.429106	3.429268	3.429429	3.429591	162
3.430559	3.430719	3.430881	3.431042	3.431203	161
3.432167	3.432328	3.432488	3.432649	3.432809	161
3.433769	3.433929	3.434089	3.434249	3.434409	160
3.435366	3.435526	3.435685	3.435844	3.436004	159
3.436957	3.437116	3.437275	3.437433	3.437591	159
3.438542	3.438701	3.438859	3.439017	3.439175	158
3.440122	3.440279	3.440437	3.440594	3.440752	158
3.441695	3.441852	3.442009	3.442166	3.442323	157
3.443263	3.443419	3.443576	3.443732	3.443889	157
3.444825	3.444981	3.445137	3.445293	3.445449	156
3.446382	3.446537	3.446692	3.446848	3.447003	155

N.	0	1	2	3	4
280	3.447450	3.447313	3.447468	3.447623	3.447778
281	3.448706	3.448861	3.449015	3.449167	3.449324
282	3.450249	3.450423	3.450557	3.450711	3.450867
283	3.451785	3.451939	3.452093	3.452247	3.452399
284	3.453318	3.453471	3.453624	3.453777	3.453929
285	3.454845	3.454997	3.455149	3.455302	3.455454
286	3.456366	3.456518	3.456669	3.456821	3.456973
287	3.457889	3.458033	3.458184	3.458336	3.458487
288	3.459392	3.459543	3.459694	3.459845	3.459995
289	3.460898	3.461048	3.461198	3.461348	3.461499
290	3.462398	3.462548	3.462697	3.462847	3.462997
291	3.463893	3.464042	3.464191	3.464340	3.464489
292	3.465383	3.465532	3.465680	3.465829	3.465977
293	3.466868	3.467016	3.467164	3.467312	3.467460
294	3.468347	3.468495	3.468642	3.468790	3.468798
295	3.469822	3.469969	3.470116	3.470263	3.470410
296	3.471292	3.471438	3.471585	3.471732	3.471878
297	3.472756	3.472903	3.473049	3.473195	3.473341
298	3.474216	3.474362	3.474508	3.474653	3.474799
299	3.475671	3.475816	3.475962	3.476107	3.476252
300	3.477121	3.477266	3.477411	3.477555	3.377699
301	3.478566	3.478711	3.478855	3.478999	3.479143
302	3.480007	3.480151	3.480294	3.480438	3.480582
303	3.481443	3.481586	3.481729	3.481872	3.482016
304	3.482874	3.483016	3.483159	3.483302	3.483445
305	3.484299	3.484442	3.484585	3.484727	3.484869
306	3.485721	3.485863	3.486005	3.486147	3.486289
307	3.487138	3.487279	3.487421	3.487563	3.487704
308	3.488551	3.488692	3.488833	3.488974	3.489114
309	3.489958	3.490099	3.490239	3.490379	3.490520
310	3.491362	3.491502	3.491642	3.491782	3.491921
311	3.492760	3.492900	3.493039	3.493179	3.493319
312	3.494155	3.494294	3.494433	3.494572	3.494711
313	3.495544	3.495683	3.495822	3.495960	3.496099
314	3.496929	3.497068	3.497206	3.497344	3.497483
315	3.498311	3.498448	3.498586	3.498724	3.498862
316	3.499687	3.499824	3.499962	3.500099	3.500236
317	3.501059	3.501196	3.501333	3.501470	3.501607
318	3.502427	3.502564	3.502700	3.502837	3.502973
319	3.503791	3.503927	3.504063	3.504199	3.504335

3.447932	3.448088	3.448242	3.448397	3.448552	155
3.449478	3.449633	3.449787	3.449941	3.450095	154
3.451018	3.451172	3.451326	3.451479	3.451633	154
3.452553	3.452706	3.452859	3.453012	3.453165	153
3.454082	3.454235	3.454387	3.454539	3.454691	153
3.455606	3.455758	3.455910	3.456062	3.456214	152
3.457125	3.457276	3.457428	3.457579	3.457731	152
3.458638	3.458789	3.458939	3.459091	3.459242	151
3.460146	3.460296	3.460447	3.460597	3.460748	151
3.461649	3.461799	3.461948	3.462098	3.462248	150
3.463146	3.463296	3.463445	3.463594	3.463744	150
3.464639	3.464787	3.464936	3.465085	3.465234	149
3.466126	3.466274	3.466423	3.466571	3.466719	149
3.467608	3.467756	3.467904	3.468052	3.468199	148
3.469085	3.469233	3.469380	3.469527	3.469675	147
3.470557	3.470704	3.470851	3.470998	3.471145	147
3.472025	3.472171	3.472318	3.472464	3.472610	146
3.473487	3.473633	3.473779	3.473925	3.474071	146
3.474944	3.475089	3.475235	3.475381	3.475526	146
3.476397	3.476542	3.476687	3.476832	3.476976	145
3.477844	3.377989	3.478133	3.378278	3.378422	145
3.479287	3.479431	3.479575	3.479719	3.479863	144
3.480725	3.480869	3.481012	3.481156	3.481299	144
3.482159	3.482302	3.482445	3.482588	3.482731	143
3.483587	3.483729	3.483872	3.484015	3.484157	142
3.485011	3.485153	3.485295	3.485437	3.485579	142
3.486430	3.486572	3.486714	3.486855	3.486997	142
3.487845	3.487986	3.488127	3.488269	3.488409	141
3.489255	3.489396	3.489537	3.489677	3.489818	141
3.490661	3.490801	3.490941	3.491081	3.491221	140
3.492062	3.492201	3.492341	3.492481	3.492621	140
3.493458	3.493597	3.493737	3.493876	3.494015	139
3.494850	3.494989	3.495128	3.495267	3.495406	139
3.496238	3.496376	3.496515	3.496653	3.496791	139
3.497621	3.497759	3.497897	3.498035	3.498173	138
3.498999	3.499137	3.499275	3.499412	3.499549	138
3.500374	3.500510	3.500648	3.500785	3.500922	137
3.501744	3.501880	3.502017	3.502154	3.502291	137
3.503109	3.503246	3.503382	3.503518	3.503655	136
3.504471	3.504607	3.504743	3.504878	3.505014	136

N.	0	1	2	3	4
320	3.505149	3.505286	3.505421	3.505557	3.505693
321	3.506505	3.506640	3.506776	3.506911	3.507046
322	3.507856	3.507991	3.508126	3.508260	3.508395
323	3.509243	3.509337	3.509471	3.509606	3.509740
324	3.510545	3.510679	3.510813	3.510941	3.511081
325	3.511883	3.512017	3.512151	3.512284	3.512418
326	3.513218	3.513351	3.513484	3.513617	3.513750
327	3.514548	3.514681	3.514813	3.514946	3.515079
328	3.515874	3.516006	3.516139	3.516271	3.516403
329	3.517196	3.517328	3.517459	3.517592	3.517724
330	3.518514	3.518646	3.518777	3.518909	3.519040
331	3.519828	3.519959	3.520090	3.520221	3.520352
332	3.521138	3.521269	3.521399	3.521530	3.521661
333	3.522444	3.522575	3.522705	3.522835	3.522966
334	3.523746	3.523876	3.524006	3.524136	3.524266
335	3.525045	3.525174	3.525304	3.525434	3.525563
336	3.526339	3.526469	3.526598	3.526727	3.526856
337	3.527629	3.527759	3.527888	3.528016	3.528145
338	3.528916	3.529045	3.529174	3.529302	3.529430
339	3.530199	3.530328	3.530456	3.530584	3.530712
340	3.531479	3.531607	3.531734	3.531862	3.531989
341	3.532754	3.532882	3.533009	3.533136	3.533264
342	3.534026	3.534153	3.534280	3.534407	3.534533
343	3.535294	3.535421	3.535547	3.535674	3.535800
344	3.536558	3.536685	3.536811	3.536937	3.537063
345	3.537819	3.537945	3.538071	3.538197	3.538323
346	3.539076	3.539202	3.539327	3.539452	3.539577
347	3.540329	3.540455	3.540579	3.540705	3.540831
348	3.541579	3.541704	3.541829	3.541953	3.542078
349	3.542825	3.542949	3.543074	3.543199	3.543323
350	3.544068	3.544192	3.544316	3.544440	3.544564
351	3.545307	3.545431	3.545555	3.545678	3.545802
352	3.546543	3.546666	3.546789	3.546913	3.547036
353	3.547775	3.547898	3.548021	3.548144	3.548267
354	3.549003	3.549126	3.549249	3.549371	3.549494
355	3.550228	3.550351	3.550473	3.550595	3.550717
356	3.551449	3.551572	3.551694	3.551816	3.551938
357	3.552668	3.552789	3.552911	3.553033	3.553155
358	3.553883	3.554004	3.554126	3.554247	3.554368
359	3.555094	3.555215	3.555336	3.555457	3.555578

5	6	7	8	9	
3.505828	3.505964	3.506099	3.506234	3.506369	136
3.507181	3.507316	3.507451	3.507586	3.507721	135
3.508529	3.508664	3.508799	3.508934	3.509068	135
3.509874	3.510009	3.510143	3.510277	3.510411	134
3.511215	3.511349	3.511482	3.511616	3.511749	134
3.512551	3.512684	3.512818	3.512951	3.513084	133
3.513883	3.514016	3.514149	3.514282	3.514415	133
3.515211	3.515344	3.515476	3.515609	3.515741	133
3.516535	3.516668	3.516799	3.516932	3.517064	132
3.517855	3.517987	3.518119	3.518251	3.518382	132
3.519171	3.519303	3.519434	3.519566	3.519697	131
3.520484	3.520615	3.520745	3.520876	3.521007	131
3.521792	3.521922	3.522053	3.522183	3.522314	131
3.523096	3.523226	3.523356	3.523486	3.523616	130
3.524396	3.524526	3.524656	3.524785	3.524915	130
3.525693	3.525822	3.525951	3.526081	3.526210	129
3.526985	3.527114	3.527243	3.527372	3.527501	129
3.528274	3.528402	3.528531	3.528659	3.528788	129
3.529559	3.529687	3.529815	3.529943	3.530072	128
3.530839	3.530968	3.531096	3.531223	3.531351	128
3.532117	3.532245	3.532372	3.532499	3.532627	128
3.533391	3.533518	3.533645	3.533772	3.533899	127
3.534661	3.534787	3.534914	3.535041	3.535167	127
3.535927	3.536053	3.536179	3.536304	3.536432	126
3.537189	3.537315	3.537441	3.537567	3.537693	126
3.538448	3.538574	3.538699	3.538825	3.538951	126
3.539703	3.539829	3.539954	3.540079	3.540204	125
3.540955	3.541079	3.541205	3.541329	3.541454	125
3.542203	3.542327	3.542452	3.542576	3.542701	125
3.543447	3.543571	3.543696	3.543819	3.543944	125
3.544688	3.544812	3.544934	3.545059	3.545183	124
3.545925	3.546049	3.546172	3.546296	3.546419	124
3.547159	3.547282	3.547405	3.547529	3.547652	123
3.548389	3.548512	3.548635	3.548758	3.548881	123
3.549616	3.549739	3.549861	3.549984	3.550106	123
3.550839	3.550962	3.551106	3.551084	3.551328	122
3.552059	3.552181	3.552424	3.552303	3.552547	122
3.553276	3.553398	3.553640	3.553519	3.553762	121
3.554489	3.554610	3.554852	3.554731	3.554973	121
3.555699	3.555819	3.556061	3.555940	3.556182	121

N	0	1	2	3	4
360	3.556303	3.556423	3.556544	3.556664	3.556785
361	3.557507	3.557627	3.557748	3.557868	3.557988
362	3.558709	3.558829	3.558948	3.559068	3.559188
363	3.559907	3.560026	3.560146	3.560265	3.560385
364	3.561101	3.561221	3.561339	3.561459	3.561578
365	3.562293	3.562412	3.562532	3.562649	3.562765
366	3.563481	3.563599	3.563718	3.563832	3.563955
367	3.564666	3.564784	3.564903	3.565021	3.565139
368	3.565848	3.565966	3.566084	3.566202	3.566319
369	3.567026	3.567144	3.567262	3.567379	3.567497
370	3.568202	3.568319	3.568436	3.568554	3.568671
371	3.569374	3.569491	3.569608	3.569725	3.569842
372	3.570543	3.570659	3.570776	3.570893	3.571009
373	3.571709	3.571825	3.571942	3.572058	3.572174
374	3.572872	3.572988	3.573104	3.573219	3.573336
375	3.574031	3.574147	3.574262	3.574379	3.574494
376	3.575188	3.575303	3.575419	3.575534	3.575649
377	3.576341	3.576457	3.576571	3.576687	3.576802
378	3.577492	3.577607	3.577722	3.577836	3.577951
379	3.578639	3.578754	3.578868	3.578983	3.579097
380	3.579784	3.579896	3.580012	3.580126	3.580241
381	3.580926	3.581039	3.581153	3.581267	3.581381
382	3.582063	3.582177	3.582291	3.582404	3.582518
383	3.583199	3.583426	3.583312	3.583539	3.583652
384	3.584331	3.584444	3.584587	3.584670	3.584783
385	3.585462	3.585574	3.585686	3.585799	3.585912
386	3.586587	3.586699	3.586812	3.586925	3.587039
387	3.587710	3.587823	3.587935	3.588047	3.588159
388	3.588832	3.588944	3.589056	3.589167	3.589279
389	3.589948	3.590061	3.590173	3.590284	3.590396
390	3.591061	3.591176	3.591287	3.591399	3.591509
391	3.592177	3.592288	3.592399	3.592509	3.592621
392	3.593286	3.593397	3.593508	3.593618	3.593729
393	3.594393	3.594503	3.594614	3.594724	3.594834
394	3.595496	3.595606	3.595717	3.595827	3.595937
395	3.596127	3.596707	3.596817	3.596927	3.597037
396	3.597681	3.597801	3.597914	3.598024	3.598134
397	3.598790	3.598899	3.599009	3.599119	3.599228
398	3.599883	3.599992	3.600101	3.600210	3.600319
399	3.600973	3.601082	3.601191	3.601299	3.601408

5	6	7	8	9	
3.556905	3.557026	3.557146	3.557267	3.557387	120
3.558108	3.558228	3.558349	3.558469	3.558589	120
3.559308	3.559428	3.559548	3.559667	3.559787	120
3.560504	3.560624	3.560743	3.560863	3.560982	119
3.561698	3.561817	3.561936	3.562055	3.562174	119
3.562887	3.563006	3.563125	3.563244	3.563361	119
3.564074	3.564192	3.564311	3.564429	3.564548	119
3.565257	3.565376	3.565494	3.565612	3.565729	118
3.566437	3.566555	3.566673	3.566791	3.566909	118
3.567614	3.567732	3.567849	3.567967	3.568084	118
3.568788	3.568905	3.569023	3.569139	3.569257	117
3.569959	3.570076	3.570193	3.570309	3.570426	117
3.571126	3.571243	3.571359	3.571476	3.571592	117
3.572291	3.572407	3.572523	3.572639	3.572755	116
3.573452	3.573568	3.573684	3.573799	3.573915	116
3.574609	3.574726	3.574841	3.574957	3.575072	116
3.575765	3.575880	3.575996	3.576111	3.576226	115
3.576917	3.577032	3.577147	3.577262	3.577377	115
3.578066	3.578181	3.578295	3.578409	3.578525	115
3.579212	3.579326	3.579441	3.579555	3.579669	114
3.580355	3.580469	3.580583	3.580697	3.580811	114
3.581496	3.581608	3.581722	3.581836	3.581949	114
3.582631	3.582745	3.582858	3.582972	3.583085	114
3.583765	3.583879	3.583992	3.584105	3.584218	113
3.584896	3.585009	3.585122	3.585235	3.585348	113
3.586024	3.586137	3.586249	3.586362	3.586475	113
3.587149	3.587262	3.587374	3.587486	3.587599	112
3.588272	3.588384	3.588496	3.588608	3.588719	112
3.589391	3.589503	3.589615	3.589726	3.589838	112
3.590508	3.590619	3.590730	3.590842	3.590953	111
3.591622	3.591732	3.591843	3.591955	3.592066	111
3.592732	3.592843	3.592954	3.593064	3.593175	111
3.593839	3.593950	3.594061	3.594171	3.594283	111
3.594945	3.595056	3.595165	3.595276	3.595386	110
3.596047	3.596157	3.596267	3.596377	3.596487	110
3.597146	3.597256	3.597366	3.597476	3.597586	110
3.598243	3.598353	3.598462	3.598572	3.598681	110
3.599337	3.599446	3.599556	3.599665	3.599774	109
3.600428	3.600537	3.600646	3.600755	3.600864	109
3.601517	3.601625	3.601734	3.601843	3.601951	109

N	0	1	2	3	4
400	3.602059	3.602169	3.602277	3.602386	3.602494
401	3.603144	3.603253	3.603361	3.603469	3.603577
402	3.604226	3.604334	3.604442	3.604550	3.604658
403	3.605305	3.605413	3.605521	3.605628	3.605736
404	3.606381	3.606489	3.606596	3.606704	3.606811
405	3.607455	3.607562	3.607669	3.607777	3.607884
406	3.608526	3.608633	3.608739	3.608847	3.608954
407	3.609594	3.609701	3.609808	3.609914	3.610021
408	3.610660	3.610767	3.610873	3.610979	3.611086
409	3.611723	3.611829	3.611936	3.612042	3.612148
410	3.612784	3.612889	3.612996	3.613102	3.613207
411	3.613842	3.613947	3.614053	3.614159	3.614264
412	3.614897	3.615003	3.615108	3.615213	3.615319
413	3.615950	3.616055	3.616160	3.616265	3.616370
414	3.617000	3.617105	3.617210	3.617315	3.617419
415	3.618048	3.618153	3.618257	3.618362	3.618466
416	3.619093	3.619198	3.619302	3.619406	3.619511
417	3.620136	3.620240	3.620344	3.620448	3.620552
418	3.621176	3.621280	3.621384	3.621448	3.621592
419	3.622214	3.622317	3.622421	3.622525	3.622628
420	3.623249	3.623353	3.623456	3.623559	3.623663
421	3.624282	3.624385	3.624488	3.624591	3.624695
422	3.625312	3.625415	3.625518	3.625621	3.625724
423	3.626340	3.626443	3.626546	3.626648	3.626751
424	3.627366	3.627468	3.627571	3.627673	3.627775
425	3.628389	3.628491	3.628593	3.628695	3.628797
426	3.629409	3.629512	3.629613	3.629715	3.629817
427	3.630428	3.630529	3.630631	3.630733	3.630835
428	3.631444	3.631545	3.631647	3.631748	3.631849
429	3.632457	3.632559	3.632659	3.632761	3.632862
430	3.633468	3.633569	3.633670	3.633771	3.633872
431	3.634477	3.634578	3.634679	3.634779	3.634880
432	3.635484	3.635584	3.635685	3.635785	3.635886
433	3.636488	3.636588	3.636688	3.636789	3.636889
434	3.637489	3.637589	3.637689	3.637789	3.637889
435	3.638489	3.638589	3.638689	3.638789	3.638888
436	3.639486	3.639586	3.639686	3.639785	3.639885
437	3.640481	3.640581	3.640680	3.640779	3.640879
438	3.641475	3.641573	3.641672	3.641771	3.641871
439	3.642465	3.642563	3.642662	3.642761	3.642860

5	6	7	8	9	
3.602603	3.602710	3.602819	3.602928	3.603036	108
3.603686	3.603794	3.603902	3.604009	3.604118	108
3.604766	3.604874	3.604982	3.605089	3.605197	108
3.605844	3.605951	3.606059	3.606166	3.606274	108
3.606919	3.607026	3.607133	3.607241	3.607348	107
3.607991	3.608098	3.608205	3.608312	3.608419	107
3.609061	3.609167	3.609274	3.609381	3.609488	107
3.610128	3.610234	3.610341	3.610447	3.610554	107
3.611191	3.611298	3.611405	3.611511	3.611617	106
3.612254	3.612359	3.612466	3.612572	3.612678	106
3.613313	3.613419	3.613526	3.613630	3.613736	106
3.614369	3.614475	3.614581	3.614686	3.614792	106
3.615424	3.615529	3.615634	3.615739	3.615845	105
3.616476	3.616581	3.616686	3.616790	3.616895	105
3.617525	3.617629	3.617734	3.617839	3.617943	105
3.618571	3.618676	3.618780	3.618884	3.618989	105
3.619615	3.619719	3.619824	3.619928	3.620032	104
3.620656	3.620760	3.620864	3.620968	3.621072	104
3.621695	3.621799	3.621902	3.622007	3.622110	104
3.622732	3.622835	3.622939	3.623042	3.623146	104
3.623766	3.623869	3.623973	3.624076	3.624179	103
3.624798	3.624901	3.625004	3.625107	3.625209	103
3.625827	3.625929	3.626032	3.626135	3.626237	103
3.626853	3.626956	3.627058	3.627161	3.627263	103
3.627878	3.627979	3.628082	3.628185	3.628287	102
3.628899	3.629002	3.629104	3.629206	3.629308	102
3.629919	3.630021	3.630123	3.630224	3.630326	102
3.630936	3.631038	3.631139	3.631241	3.631342	102
3.631951	3.632052	3.632153	3.632255	3.632356	101
3.632963	3.633064	3.633165	3.633266	3.633367	101
3.635975	3.634074	3.634175	3.634276	3.634376	100
3.634981	3.635081	3.635182	3.635283	3.635383	100
3.635986	3.636087	3.636187	3.636288	3.636388	100
3.636989	3.637089	3.637189	3.637289	3.637389	100
3.637989	3.638089	3.638189	3.638289	3.638389	99
3.638988	3.639088	3.639188	3.639287	3.639387	99
3.639984	3.640084	3.640183	3.640283	3.640382	99
3.640979	3.641077	3.641177	3.641276	3.641375	99
3.641969	3.642069	3.642168	3.642267	3.642366	99
3.642959	3.643058	3.643156	3.643255	3.643354	99

	0	1	2	3	4
440	3.643463	3.643551	3.643650	3.643749	3.643847
441	3.644439	3.644537	3.644636	3.644734	3.644832
442	3.645422	3.645521	3.645619	3.645717	3.645815
443	3.646404	3.646502	3.646599	3.646698	3.646796
444	3.647383	3.647481	3.647579	3.647676	3.647774
445	3.648360	3.648458	3.648555	3.648653	3.648750
446	3.649335	3.649432	3.649529	3.649627	3.649724
447	3.650308	3.650405	3.650502	3.650599	3.650696
448	3.651278	3.651375	3.651472	3.651569	3.651666
449	3.652246	3.652343	3.652439	3.652536	3.652633
450	3.653213	3.653309	3.653405	3.653502	3.653598
451	3.654177	3.654273	3.654369	3.654465	3.654562
452	3.655138	3.655235	3.655331	3.655427	3.655523
453	3.656098	3.656194	3.656289	3.656386	3.656482
454	3.657056	3.657152	3.657247	3.657343	3.657438
455	3.658011	3.658107	3.658202	3.658298	3.658393
456	3.658965	3.659060	3.659155	3.659250	3.659346
457	3.659916	3.660011	3.660106	3.660201	3.660296
458	3.660865	3.660960	3.661055	3.661149	3.661245
459	3.661813	3.661907	3.662002	3.662096	3.662191
460	3.662758	3.662852	3.662947	3.663041	3.663135
461	3.663701	3.663795	3.663889	3.663983	3.664078
462	3.664642	3.664736	3.664829	3.664924	3.665018
463	3.665581	3.665675	3.665769	3.665862	3.665956
464	3.666518	3.666611	3.666705	3.666799	3.666892
465	3.667453	3.667546	3.667639	3.667733	3.667826
466	3.668386	3.668479	3.668572	3.668665	3.668759
467	3.669317	3.669409	3.669502	3.669596	3.669689
468	3.670246	3.670339	3.670431	3.670524	3.670617
469	3.671173	3.671265	3.671358	3.671451	3.671543
470	3.672098	3.672190	3.672283	3.672375	3.672467
471	3.673021	3.673113	3.673205	3.673297	3.673389
472	3.673942	3.674034	3.674126	3.674218	3.674309
473	3.674861	3.674953	3.675045	3.675137	3.675228
474	3.675778	3.675869	3.675962	3.676053	3.676145
475	3.676694	3.676785	3.676876	3.676968	3.677059
476	3.677607	3.677698	3.677789	3.677881	3.677972
477	3.678518	3.678609	3.678700	3.678791	3.678882
478	3.679428	3.679519	3.679609	3.679700	3.679791
479	3.680336	3.680426	3.680517	3.680607	3.680698

5	6	7	8	9	
3.643946	3.644044	3.644143	3.644242	3.644340	98
3.644931	3.645029	3.645127	3.645226	3.645324	98
3.645913	3.646011	3.646109	3.646208	3.646306	98
3.646894	3.646992	3.647089	3.647187	3.647285	98
3.647872	3.647969	3.648067	3.648165	3.648262	98
3.648848	3.648945	3.649043	3.649140	3.649237	97
3.649821	3.649919	3.650016	3.650113	3.650210	97
3.650793	3.650890	3.650987	3.651084	3.651181	97
3.651762	3.651859	3.651956	3.652053	3.652149	97
3.652729	3.652826	3.652923	3.653019	3.653116	97
3.653695	3.653791	3.653887	3.653984	3.654080	96
3.654658	3.654754	3.654850	3.654946	3.655042	96
3.655619	3.655715	3.655810	3.655906	3.656002	96
3.656577	3.656673	3.656769	3.656864	3.656960	96
3.657534	3.657629	3.657725	3.657820	3.657916	96
3.658488	3.658584	3.658679	3.658774	3.658869	95
3.659441	3.659536	3.659631	3.659726	3.659821	95
3.660391	3.660486	3.660581	3.660676	3.660771	95
3.661339	3.661434	3.661529	3.661623	3.661718	95
3.662286	3.662380	3.662475	3.662569	3.662663	95
3.663229	3.663324	3.663418	3.663512	3.663607	94
3.664172	3.664266	3.664359	3.664454	3.664548	94
3.665112	3.665206	3.665299	3.665393	3.665487	94
3.666049	3.666143	3.666237	3.666331	3.666424	94
3.666986	3.667079	3.667173	3.667266	3.667359	94
3.667919	3.668013	3.668106	3.668199	3.668293	93
3.668852	3.668945	3.669038	3.669131	3.669224	93
3.669782	3.669875	3.669967	3.670060	3.670153	93
3.670709	3.670802	3.670895	3.670988	3.671080	93
3.671627	3.671728	3.671821	3.671913	3.672005	93
3.672559	3.672652	3.672744	3.672836	3.672929	92
3.673482	3.673574	3.673666	3.673758	3.673849	92
3.674402	3.674494	3.674586	3.674677	3.674769	92
3.675319	3.675412	3.675503	3.675595	3.675687	92
3.676236	3.676328	3.676419	3.676511	3.676602	92
3.677151	3.677242	3.677333	3.677424	3.677516	91
3.678063	3.678154	3.678245	3.678335	3.678427	91
3.678973	3.679064	3.679155	3.679246	3.679337	91
3.679882	3.679972	3.680063	3.680154	3.680245	91
3.680789	3.680879	3.680969	3.681060	3.681151	91

	0	1	2	3	4
480	3.681241	3.681332	3.681422	3.681513	3.681603
481	3.682145	3.682235	3.682326	3.682416	3.682506
482	3.683047	3.683137	3.683227	3.683317	3.683407
483	3.683947	3.684037	3.684127	3.684217	3.684307
484	3.684845	3.684935	3.685025	3.685114	3.685204
485	3.685742	3.685831	3.685921	3.686010	3.686099
486	3.686636	3.686726	3.686815	3.686904	3.686994
487	3.687529	3.687618	3.687707	3.687796	3.687885
488	3.688419	3.688509	3.688598	3.688687	3.688776
489	3.689309	3.689398	3.689486	3.689575	3.689664
490	3.690196	3.690285	3.690373	3.690462	3.690550
491	3.691081	3.691169	3.691258	3.691347	3.691435
492	3.691965	3.692053	3.692142	3.692229	3.692318
493	3.692847	3.692935	3.693023	3.693111	3.693199
494	3.693727	3.693815	3.693903	3.693991	3.694078
495	3.694605	3.694693	3.694781	3.694868	3.694956
496	3.695482	3.695569	3.695657	3.695744	3.695832
497	3.696356	3.696445	3.696531	3.696618	3.696706
498	3.697229	3.697317	3.697404	3.697491	3.697578
499	3.698101	3.698188	3.698275	3.698362	3.698449
500	3.698970	3.699057	3.699144	3.699231	3.699317
501	3.699838	3.699924	3.700011	3.700098	3.700184
502	3.700704	3.700790	3.700877	3.700963	3.701049
503	3.701568	3.701654	3.701741	3.701827	3.701913
504	3.702430	3.702517	3.702603	3.702689	3.702775
505	3.703291	3.703377	3.703463	3.703549	3.703635
506	3.704151	3.704236	3.704322	3.704408	3.704494
507	3.705008	3.705094	3.705179	3.705265	3.705350
508	3.705864	3.705949	3.706035	3.706120	3.706206
509	3.706718	3.706803	3.706888	3.706974	3.707059
510	3.707570	3.707655	3.707740	3.707826	3.707911
511	3.708421	3.708506	3.708591	3.708676	3.708761
512	3.709269	3.709355	3.709439	3.709524	3.709609
513	3.710117	3.710202	3.710287	3.710371	3.710456
514	3.710963	3.711048	3.711132	3.711217	3.711301
515	3.711807	3.711892	3.711976	3.712060	3.712144
516	3.712649	3.712734	3.712818	3.712902	3.712986
517	3.713491	3.713575	3.713659	3.713742	3.713826
518	3.714329	3.714414	3.714497	3.714581	3.714665
519	3.715167	3.715251	3.715335	3.715418	3.715501

3.681693	3.681784	3.681874	3.681964	3.682053	90
3.682596	3.682686	3.682777	3.682867	3.682957	90
3.683497	3.683587	3.683677	3.683767	3.683857	90
3.684396	3.684486	3.684576	3.684666	3.684756	90
3.685294	3.685383	3.685473	3.685563	3.685652	90
3.686189	3.686279	3.686368	3.686458	3.686547	89
3.687083	3.687172	3.687261	3.687351	3.687439	89
3.687975	3.688064	3.688153	3.688242	3.688331	89
3.688865	3.688953	3.689042	3.689131	3.689220	89
3.689753	3.689841	3.689930	3.690019	3.690107	89
3.690639	3.690728	3.690816	3.690905	3.690993	89
3.691524	3.691612	3.691700	3.691789	3.691877	88
3.692406	3.692494	3.692583	3.692671	3.692759	88
3.693287	3.693375	3.693463	3.693551	3.693639	88
3.694166	3.694254	3.694342	3.694429	3.694517	88
3.695044	3.695131	3.695219	3.695307	3.695394	88
3.695919	3.696007	3.696094	3.696182	3.696269	87
3.696793	3.696880	3.696968	3.697055	3.697142	87
3.697665	3.697752	3.697839	3.697926	3.698014	87
3.698537	3.698622	3.698709	3.698796	3.698883	87
3.699404	3.699491	3.699578	3.699664	3.699751	87
3.700271	3.700358	3.700444	3.700531	3.700617	87
3.701136	3.701222	3.701309	3.701395	3.701482	86
3.701929	3.702086	3.702172	3.702258	3.702344	86
3.702861	3.702947	3.703033	3.703119	3.703205	86
3.703721	3.703807	3.703893	3.703979	3.704065	86
3.704579	3.704665	3.704751	3.704837	3.704922	86
3.705436	3.705522	3.705607	3.705693	3.705778	86
3.706291	3.706376	3.706462	3.706547	3.706634	85
3.707144	3.707219	3.707315	3.707399	3.707485	85
3.707996	3.708081	3.708166	3.708251	3.708336	85
3.708846	3.708931	3.709015	3.709100	3.709185	85
3.709694	3.709779	3.709863	3.709948	3.710033	85
3.710540	3.710625	3.710709	3.710794	3.710879	85
3.711385	3.711469	3.711554	3.711639	3.711723	84
3.711229	3.711313	3.711397	3.711481	3.711566	84
3.713070	3.713154	3.713238	3.713323	3.713407	84
3.713910	3.713994	3.714078	3.714162	3.714246	84
3.714749	3.714833	3.714916	3.714999	3.715084	84
3.715586	3.715669	3.715753	3.715836	3.715919	84

	0	1	2	3	4
520	3.716003	3.716087	3.716170	3.716254	3.716337
521	3.716838	3.716921	3.717004	3.717088	3.717171
522	3.717671	3.717754	3.717837	3.717920	3.718003
523	3.718502	3.718585	3.718668	3.718751	3.718834
524	3.719331	3.719414	3.719497	3.719579	3.719663
525	3.720159	3.720242	3.720325	3.720407	3.720490
526	3.720986	3.721068	3.721151	3.721233	3.721316
527	3.721811	3.721893	3.721975	3.722058	3.722140
528	3.722634	3.722716	3.722798	3.722881	3.722963
529	3.723456	3.723538	3.723619	3.723702	3.723784
530	3.724276	3.724358	3.724439	3.724522	3.724604
531	3.725095	3.725176	3.725258	3.725339	3.725421
532	3.725912	3.725993	3.726075	3.726156	3.726238
533	3.726727	3.726809	3.726890	3.726972	3.727053
534	3.727541	3.727623	3.727704	3.727785	3.727866
535	3.728354	3.728435	3.728516	3.728597	3.728678
536	3.729165	3.729246	3.729327	3.729408	3.729489
537	3.729974	3.730055	3.730136	3.730217	3.730298
538	3.730782	3.730862	3.730944	3.731024	3.731105
539	3.731589	3.731669	3.731749	3.731830	3.731911
540	3.732394	3.732474	3.732555	3.732635	3.732715
541	3.733197	3.733278	3.733358	3.733438	3.733518
542	3.733999	3.734079	3.734159	3.734239	3.734319
543	3.734799	3.334879	3.734959	3.735039	3.735119
544	3.735599	3.735679	3.735759	3.735838	3.735918
545	3.736397	3.736476	3.736556	3.736635	3.736715
546	3.737192	3.737272	3.737352	3.737431	3.737511
547	3.737987	3.738067	3.738146	3.738225	3.738305
548	3.738781	3.738859	3.738939	3.739018	3.739097
549	3.739572	3.739651	3.739731	3.739809	3.739888
550	3.740363	3.740442	3.740521	3.740599	3.740678
551	3.741152	3.741230	3.741309	3.741388	3.741466
552	3.741938	3.742018	3.742096	3.742175	3.742254
553	3.742725	3.742802	3.742881	3.742961	3.743038
554	3.743509	3.743588	3.743667	3.743745	3.743823
555	3.744293	3.744371	3.744449	3.744528	3.744606
556	3.745077	3.745155	3.745231	3.745309	3.745387
557	3.745859	3.745937	3.746015	3.746089	3.746167
558	3.746634	3.746712	3.746789	3.746868	3.746945
559	3.747415	3.747489	3.747567	3.747645	3.747723

.716421	3.716504	3.716588	3.716671	3.716754	83
.717254	3.717338	3.717421	3.717504	3.717587	83
.718086	3.718169	3.718253	3.718336	3.718419	83
.718917	3.718999	3.719083	3.719165	3.719248	83
.719745	3.719828	3.719911	3.719994	3.720077	83
.720673	3.720655	3.720738	3.720821	3.720903	83
.721398	3.721481	3.721565	3.721646	3.721728	82
.722222	3.722305	3.722387	3.722469	3.722552	82
.723045	3.723127	3.723209	3.723291	3.723374	82
.723866	3.723948	3.724029	3.724112	3.724194	82
.724686	3.724767	3.724849	3.724931	3.725013	82
.725503	3.725585	3.725667	3.725748	3.725830	82
.726319	3.726401	3.726483	3.726564	3.726646	82
.727134	3.727216	3.727297	3.727379	3.727459	81
.727948	3.728029	3.728110	3.728191	3.728273	81
.728759	3.728841	4.728922	3.729003	3.729084	81
.729569	3.729651	3.729732	3.729813	3.729893	81
.730378	3.730459	3.730540	3.730621	3.730702	81
.731186	3.731266	3.731347	3.731428	3.731508	81
.731991	3.732072	3.732152	3.732233	3.732313	81
.732796	3.732876	3.732956	3.733037	3.733117	80
.733598	3.733679	3.733759	3.733839	3.733919	80
.734399	3.734479	3.734559	3.734639	3.734719	80
.735199	3.735279	3.735359	3.735439	3.735519	80
.735998	3.736078	3.736157	3.736237	3.736317	80
.736795	3.736874	3.736954	3.737034	3.737113	80
.737590	3.737669	3.737749	3.737829	3.737908	79
.738384	3.738463	3.738543	3.738622	3.738701	79
.739177	3.739256	3.739335	3.739414	3.739493	79
.739968	3.740047	3.740126	3.740205	3.740284	79
.740757	3.740836	3.740915	3.740994	3.741073	79
.741546	4.741624	3.741703	3.741782	3.741860	79
.742332	3.742411	3.742489	3.742568	3.742647	79
.743118	3.743196	3.743275	3.743353	3.743431	78
.743902	3.743979	3.744058	3.744136	3.744215	78
.744684	3.744762	3.744840	3.744919	3.744997	78
.745465	3.745543	3.745621	3.745699	3.745777	78
.746245	3.746323	3.746401	3.746479	3.746556	78
.747023	3.747101	3.747179	3.747256	3.747334	78
.747800	3.747878	3.747955	3.748033	3.748110	78

N	0	1	2	3	4
560	3.748168	3.748266	3.748343	3.748421	3.748498
561	3.748963	3.749040	3.749118	3.749195	3.749272
562	3.749736	3.749814	3.749891	3.749968	3.750045
563	3.750508	3.750586	3.750663	3.750739	3.750817
564	3.751279	3.751356	3.751433	3.751510	3.751587
565	3.752048	3.752125	3.752202	3.752279	3.752356
566	3.752816	3.752893	3.752969	3.753047	3.753123
567	3.753583	3.753659	3.753736	3.753813	3.753889
568	3.754348	3.754425	3.754501	3.754578	3.754654
569	3.755112	3.755189	3.755265	3.755341	3.755417
570	3.755875	3.755951	3.756027	3.756103	3.756179
571	3.756636	3.756712	3.756788	3.756864	3.756940
572	3.757396	3.757472	3.757548	3.757624	3.757699
573	3.758155	3.758230	3.758306	3.758382	3.758458
574	3.758912	3.758988	3.759063	3.759139	3.759214
575	3.759668	3.759743	3.759819	3.759894	3.759969
576	3.760422	3.760498	3.760573	3.760649	3.760723
577	3.761176	3.761251	3.761326	3.761402	3.761477
578	3.761928	3.762003	3.762078	3.762153	3.762228
579	3.762679	3.762754	3.762829	3.762904	3.762978
580	3.763428	3.763503	3.763578	3.763653	3.763727
581	3.764176	3.764251	3.764326	3.764400	3.764475
582	3.764923	3.764998	3.765072	3.765147	3.765221
583	3.765669	3.765743	3.765818	3.765892	3.765966
584	3.766413	3.766487	3.766562	3.766636	3.766710
585	3.767156	3.767230	3.767304	3.767379	3.767453
586	3.767898	3.767972	3.768046	3.768119	3.768194
587	3.768638	3.768712	3.768786	3.768860	3.768934
588	3.769377	3.769451	3.769525	3.769599	3.769673
589	3.770115	3.770189	3.770263	3.770336	3.770410
590	3.770852	3.770926	3.770999	3.771073	3.771146
591	3.771587	3.771661	3.771734	3.771808	3.771881
592	3.772322	3.772395	3.772468	3.772542	3.772615
593	3.773055	3.773128	3.773201	3.773274	3.773348
594	3.773786	3.773859	3.773933	3.774006	3.774079
595	3.774517	3.774585	3.774663	3.774736	3.774809
596	3.775246	3.775319	3.775392	3.775465	3.775538
597	3.775974	3.776047	3.776119	3.776193	3.776265
598	3.776701	3.776774	3.776846	3.776919	3.776992
599	3.777427	3.777499	3.777572	3.777644	3.777717

3.748576	3.748653	3.748731	3.748808	3.748885	77
3.749349	3.749423	3.749504	3.749582	3.749659	77
3.750123	3.750199	3.750277	3.750354	3.750431	77
3.750894	3.750971	3.751048	3.751125	3.751202	77
3.751664	3.751741	3.751818	3.751895	3.751972	77
3.752433	3.752509	3.752586	3.752663	3.752739	77
3.753199	3.753277	3.753353	3.753429	3.753506	77
3.753966	3.754042	3.754119	3.754195	3.754272	77
3.754730	3.754807	3.754883	3.754959	3.755035	76
3.755494	3.755569	3.755646	3.755722	3.755799	76
3.756256	3.756332	3.756408	3.756484	3.756560	76
3.757016	3.757092	3.757168	3.757244	3.757320	76
3.757775	3.757851	3.757927	3.758003	3.758079	76
3.758533	3.758609	3.758685	3.758761	3.758836	76
3.759290	3.759366	3.759441	3.759517	3.759592	76
3.760043	3.760121	3.760196	3.760272	3.760347	75
3.760799	3.760875	3.760949	3.761025	3.761101	77
3.761552	3.761627	3.761702	3.761778	3.761853	75
3.762303	3.762378	3.762453	3.762529	3.762604	75
3.763053	3.763128	3.763203	3.763279	3.763353	75
3.763801	3.763877	3.763952	3.764027	3.764101	75
3.764549	3.764624	3.764699	3.764774	3.764848	75
3.765296	3.765370	3.765445	3.765519	3.765594	75
3.766041	3.766115	3.766189	3.766264	3.766338	74
3.766785	3.766859	3.766933	3.767007	3.767082	74
3.767527	3.767601	3.767675	3.767749	3.767823	74
3.768268	3.768342	3.768416	3.768490	3.768564	74
3.769008	3.769082	3.769156	3.769229	3.769303	74
3.769746	3.769820	3.769894	3.769968	3.770042	74
3.770484	3.770557	3.770631	3.770705	3.770778	74
3.771219	3.771293	3.771367	3.771440	3.771514	74
3.771955	3.772028	3.772102	3.772175	3.772248	73
3.772688	3.772762	3.772835	3.772908	3.772981	73
3.773421	3.773494	3.773567	3.773640	3.773713	73
3.774152	3.774225	3.774298	3.774371	3.774444	73
3.774882	3.774955	3.775028	3.775100	3.775173	73
3.775610	3.775683	3.775756	3.775829	3.775902	73
3.776338	3.776411	3.776483	3.776556	3.776629	73
3.777064	3.777137	3.777209	3.777282	3.777354	73
3.777789	3.777862	3.777934	3.778006	3.778079	73

	0	1	2	3	4
600	3.778251	3.778244	3.778296	3.778368	3.778441
601	3.778874	3.778947	3.779019	3.779091	3.779163
602	3.779596	3.779669	3.779741	3.779813	3.779885
603	3.780317	3.780389	3.780461	3.780533	3.780605
604	3.781037	3.781109	3.781181	3.781253	3.781324
605	3.781755	3.781827	3.781899	3.781971	3.782042
606	3.782473	3.782544	3.782616	3.782688	3.782759
607	3.783189	3.783260	3.783332	3.783403	3.783475
608	3.783904	3.783975	3.784046	3.784118	3.784189
609	3.784617	3.784689	3.784759	3.784831	3.784902
610	3.785329	3.785401	3.785472	3.785543	3.785613
611	3.786041	3.786112	3.786183	3.786254	3.786325
612	3.786751	3.786822	3.786893	3.786964	3.787035
613	3.787460	3.787531	3.787602	3.787673	3.787744
614	3.788168	3.788239	3.788309	3.788381	3.788451
615	3.788875	3.788946	3.789016	3.789087	3.789157
616	3.789581	3.789651	3.789722	3.789792	3.789863
617	3.790286	3.790356	3.790426	3.790496	3.790567
618	3.790989	3.791059	3.791129	3.791199	3.791269
619	3.791691	3.791761	3.791831	3.791901	3.791971
620	3.792392	3.792462	3.792532	3.792602	3.792672
621	3.793092	3.793162	3.793232	3.793302	3.793371
622	3.793791	3.793860	3.793930	3.793999	3.794069
623	3.794488	3.794558	3.794627	3.794697	3.794767
624	3.795184	3.795254	3.795324	3.795393	3.795463
625	3.795880	3.795949	3.796018	3.796088	3.796158
626	3.796574	3.796644	3.796713	3.796782	3.796852
627	3.797267	3.797337	3.797406	3.797475	3.797545
628	3.797960	3.798029	3.798098	3.798167	3.798236
629	3.798651	3.798719	3.798789	3.798858	3.798927
630	3.799341	3.799409	3.799478	3.799547	3.799616
631	3.800029	3.800098	3.800167	3.800236	3.800305
632	3.800717	3.800786	3.800854	3.800923	3.800992
633	3.801404	3.801472	3.801541	3.801609	3.801678
634	3.802089	3.802158	3.802226	3.802295	3.802363
635	3.802774	3.802842	3.802910	3.802979	3.803047
636	3.803457	3.803525	3.803594	3.803661	3.803730
637	3.804139	3.804208	3.804276	3.804344	3.804412
638	3.804821	3.804889	3.804957	3.805025	3.805093
639	3.805501	3.805569	3.805637	3.805705	3.805773

5	6	7	8	9		
3.778513	3.778585	3.778658	3.778729	3.778802		72
3.779236	3.779308	3.779380	3.779452	3.779524		72
3.779957	3.780029	3.780101	3.780173	3.780245		72
3.780677	3.780749	3.780821	3.780893	3.780963		72
3.781396	3.781468	3.781539	3.781612	3.781684		72
3.782114	3.782186	3.782258	3.782329	3.782401		72
3.782831	3.782902	3.782974	3.783046	3.783117		72
3.783546	3.783618	3.783689	3.783761	3.783832		71
3.784261	3.784332	3.784403	3.784475	3.784546		71
3.784974	3.785045	3.785116	3.785187	3.785259		71
3.785686	3.785757	3.785828	3.785899	3.785970		71
3.786396	3.786467	3.786538	3.786609	3.786680		71
3.787106	3.787177	3.787248	3.787319	3.787389		71
3.787815	3.787885	3.787956	3.788027	3.788098		71
3.788522	3.788593	3.788663	3.788734	3.788804		71
3.789228	3.789299	3.789369	3.789439	3.789510		71
3.789933	3.790004	3.790074	3.790144	3.790215		70
3.790637	3.790707	3.790778	3.790848	3.790918		70
3.791339	3.791409	3.791480	3.791550	3.791620		70
3.792041	3.792111	3.792181	3.792252	3.792322		70
3.792742	3.792812	3.792882	3.792952	3.793022		70
3.793441	3.793511	3.793581	3.793651	3.793721		70
3.794139	3.794209	3.794279	3.794349	3.794418		70
3.794836	3.794906	3.794976	3.795045	3.795115		70
3.795532	3.795602	3.795672	3.795741	3.795810		70
3.796227	3.796297	3.796366	3.796439	3.796505		69
3.796921	3.796990	3.797059	3.797129	3.799198		69
3.797614	3.797683	3.797752	3.797821	3.797890		69
3.798305	3.798374	3.798443	3.798513	3.798582		69
3.798996	3.799065	3.799134	3.799003	3.799272		69
3.799685	3.799754	3.799823	3.799892	3.799961		69
3.800373	3.800442	3.800511	3.800579	3.800648		69
3.801061	3.801129	3.801198	3.801266	3.801335		69
3.801747	3.801815	3.801884	3.801953	3.802021		69
3.802432	3.802500	3.802568	3.802637	3.802705		68
3.803116	3.803184	3.803252	3.803321	3.803389		68
3.803798	3.803867	3.803935	3.804003	3.804071		68
3.804480	3.804548	3.804616	3.804685	3.804753		68
3.805161	3.805229	3.805297	3.805365	3.805433		68
3.805841	3.805908	3.805976	3.806044	3.806112		68

N.	0	1	2	3	4
640	3.806179	3.806248	3.806316	3.806384	3.806451
641	3.806858	3.806926	3.806994	3.807061	3.807129
642	3.807535	3.807603	3.807670	3.807738	3.807806
643	3.808211	3.808279	3.808346	3.808414	3.808481
644	3.808886	3.808953	3.809021	3.809088	3.809156
645	3.809559	3.809627	3.809694	3.809762	3.809829
646	3.810233	3.810299	3.810367	3.810434	3.810501
647	3.810904	3.810971	3.811039	3.811106	3.811173
648	3.811575	3.811642	3.811709	3.811776	3.811843
649	3.812245	3.812312	3.812379	3.812445	3.812512
650	3.812913	3.812980	3.813047	3.813114	3.813181
651	3.813581	3.813648	3.813714	3.813781	3.813848
652	3.814248	3.814314	3.814381	3.814447	3.814514
653	3.814913	3.814979	3.815046	3.815113	3.815179
654	3.815578	3.815644	3.815711	3.815777	3.815844
655	3.816241	3.816308	3.816374	3.816440	3.816507
656	3.816904	3.816970	3.817036	3.817102	3.817169
657	3.817565	3.817631	3.817698	3.817764	3.817831
658	3.818226	3.818292	3.818358	3.818424	3.818491
659	3.818885	3.818951	3.819017	3.819083	3.819149
660	3.819543	3.819609	3.819676	3.819741	3.819808
661	3.820201	3.820267	3.820333	3.820399	3.820466
662	3.820858	3.820924	3.820989	3.821055	3.821121
663	3.821514	3.821579	3.821645	3.821709	3.821776
664	3.822168	3.822233	3.822299	3.822364	3.822430
665	3.822822	3.822887	3.822952	3.823018	3.823083
666	3.823474	3.823539	3.823605	3.823669	3.823735
667	3.824126	3.824191	3.824256	3.824321	3.824387
668	3.824776	3.824841	3.824906	3.824971	3.825036
669	3.825426	3.825491	3.825556	3.825621	3.825686
670	3.826075	3.826139	3.826204	3.826269	3.826333
671	3.826723	3.826787	3.826852	3.826917	3.826981
672	3.827369	3.827434	3.827499	3.827563	3.827628
673	3.828015	3.828079	3.828144	3.828209	3.828273
674	3.828659	3.828724	3.828789	3.828853	3.828918
675	3.829304	3.829368	3.829432	3.829497	3.829561
676	3.829947	3.830011	3.830075	3.830139	3.830204
677	3.830589	3.830653	3.830717	3.830781	3.830845
678	3.831229	3.831294	3.831358	3.831422	3.831486
679	3.831860	3.831924	3.831998	3.832062	3.832126

5	6	7	8	9	10	
3.806519	3.806587	3.806655	3.806723	3.806790		68
3.807197	3.807264	3.807332	3.807399	3.807467		68
3.807873	3.807941	3.808008	3.808076	3.808143		68
3.808549	3.808616	3.808684	3.808751	3.808818		67
3.809223	3.809290	3.809358	3.809425	3.809492		67
3.809896	3.809964	3.810031	3.810098	3.810165		67
3.810569	3.810636	3.810703	3.810770	3.810837		67
3.811239	3.811307	3.811374	3.811441	3.811508		67
3.811909	3.811977	3.812044	3.812111	3.812178		67
3.812579	3.812646	3.812713	3.812779	3.812847		67
3.813247	3.813314	3.813381	3.813448	3.813514		66
3.813914	3.813981	3.814048	3.814114	3.814181		66
3.814581	3.814647	3.814714	3.814780	3.814847		66
3.815246	3.815312	3.815378	3.815445	3.815511		66
3.815909	3.815976	3.816042	3.816109	3.816175		66
3.816573	3.816639	3.816705	3.816771	3.816838		66
3.817235	3.817301	3.817367	3.817433	3.817499		66
3.817896	3.817962	3.818028	3.818094	3.818159		66
3.818556	3.818622	3.818688	3.818754	3.818819		66
3.819215	3.819281	3.819346	3.819412	3.819478		66
3.819873	3.819939	3.820004	3.820070	3.820136		66
3.820529	3.820595	3.820661	3.820727	3.820792		66
3.821186	3.821251	3.821317	3.821382	3.821448		66
3.821841	3.821906	3.821972	3.822037	3.822103		65
3.822495	3.822560	3.822626	3.822691	3.822756		65
3.823148	3.823213	3.823279	3.823344	3.823409		65
3.823800	3.823865	3.823930	3.823996	3.824061		65
3.824451	3.824516	3.824581	3.824646	3.824711		65
3.825101	3.825166	3.825231	3.825296	3.825361		65
3.825751	3.825815	3.825880	3.825945	3.826009		65
3.826399	3.826464	3.826528	3.826593	3.826658		65
3.827046	3.827111	3.827175	3.827239	3.827305		65
3.827692	3.827757	3.827822	3.827886	3.827951		65
3.828338	3.828402	3.828467	3.828531	3.828595		64
3.828982	3.829046	3.829111	3.829175	3.829239		64
3.829625	3.829689	3.829754	3.829818	3.829882		64
3.830268	3.830332	3.830396	3.830460	3.830525		64
3.830909	3.830973	3.831037	3.831102	3.831166		64
3.831549	3.831614	3.831678	3.831742	3.831806		64
3.832189	3.832253	3.832317	3.832381	3.832445		64

N.	0	1	2	3	4
680	3.8325099	3.8325736	3.8326373	3.8327009	3.8327646
681	3.8331473	3.8332111	3.8332748	3.8333385	3.8334022
682	3.8337848	3.8338485	3.8339122	3.8339759	3.8340396
683	3.8344221	3.8344858	3.8345495	3.8346132	3.8346769
684	3.8350596	3.8351233	3.8351869	3.8352506	3.8353143
685	3.8356971	3.8357608	3.8358245	3.8358881	3.8359518
686	3.8363346	3.8363983	3.8364620	3.8365257	3.8365894
687	3.8369720	3.8370357	3.8370994	3.8371631	3.8372268
688	3.8376094	3.8376731	3.8377368	3.8378005	3.8378642
689	3.8382469	3.8383106	3.8383743	3.8384380	3.8385017
690	3.8388843	3.8389480	3.8390117	3.8390754	3.8391391
691	3.8395218	3.8395855	3.8396492	3.8397129	3.8397766
692	3.8401592	3.8402229	3.8402866	3.8403503	3.8404140
693	3.8407967	3.8408604	3.8409241	3.8409878	3.8410515
694	3.8414341	3.8414978	3.8415615	3.8416252	3.8416889
695	3.8420715	3.8421352	3.8421989	3.8422626	3.8423263
696	3.8426089	3.8426726	3.8427363	3.8428000	3.8428637
697	3.8431463	3.8432100	3.8432737	3.8433374	3.8434011
698	3.8436837	3.8437474	3.8438111	3.8438748	3.8439385
699	3.8442211	3.8442848	3.8443485	3.8444122	3.8444759
700	3.8447585	3.8448222	3.8448859	3.8449496	3.8450133
701	3.8452958	3.8453595	3.8454232	3.8454869	3.8455506
702	3.8458332	3.8458969	3.8459606	3.8460243	3.8460880
703	3.8463705	3.8464342	3.8464979	3.8465616	3.8466253
704	3.8469078	3.8469715	3.8470352	3.8470989	3.8471626
705	3.8474451	3.8475088	3.8475725	3.8476362	3.8476999
706	3.8479824	3.8480461	3.8481098	3.8481735	3.8482372
707	3.8485197	3.8485834	3.8486471	3.8487108	3.8487745
708	3.8490570	3.8491207	3.8491844	3.8492481	3.8493118
709	3.8495943	3.8496580	3.8497217	3.8497854	3.8498491
710	3.8501316	3.8501953	3.8502590	3.8503227	3.8503864
711	3.8506689	3.8507326	3.8507963	3.8508600	3.8509237
712	3.8512062	3.8512699	3.8513336	3.8513973	3.8514610
713	3.8517435	3.8518072	3.8518709	3.8519346	3.8519983
714	3.8522808	3.8523445	3.8524082	3.8524719	3.8525356
715	3.8528181	3.8528818	3.8529455	3.8530092	3.8530729
716	3.8533554	3.8534191	3.8534828	3.8535465	3.8536102
717	3.8538927	3.8539564	3.8540201	3.8540838	3.8541475
718	3.8544300	3.8544937	3.8545574	3.8546211	3.8546848
719	3.8549673	3.8550310	3.8550947	3.8551584	3.8552221

5	6	7	8	9	
3.832828	3.832892	3.832956	3.833019	3.833083	64
3.833466	3.833529	3.833593	3.833657	3.833721	64
3.834103	3.834166	3.834229	3.834294	3.834357	64
3.834739	3.834802	3.834866	3.834929	3.834993	64
3.835373	3.835437	3.835520	3.835564	3.835627	63
3.836007	3.836071	3.836134	3.836197	3.836261	63
3.836641	3.836704	3.836967	3.836830	3.836894	63
3.837273	3.837336	3.837399	3.837462	3.837525	63
3.837904	3.837867	3.838030	3.838093	3.838156	63
3.838534	3.838597	3.838660	3.838723	3.838786	63
3.839164	3.839227	3.839280	3.839352	3.839415	63
3.839729	3.839855	3.839918	3.839981	3.840043	63
3.840419	3.840482	3.840545	3.840608	3.840671	63
3.841049	3.841109	3.841172	3.841234	3.841297	63
3.841671	3.841735	3.841797	3.841859	3.841922	63
3.842297	3.842359	3.842422	3.842484	3.842547	62
3.842921	3.842983	3.843046	3.843108	3.843170	62
3.843544	3.843606	3.843669	3.843731	3.843793	62
3.844166	3.844229	3.844291	3.844353	3.844415	62
3.844788	3.844849	3.844911	3.844974	3.845036	62
3.845408	3.845470	3.845532	3.845594	3.845656	62
3.846028	3.846089	3.846151	3.846213	3.846275	62
3.846646	3.846708	3.846769	3.846832	3.846894	62
3.847264	3.847326	3.847388	3.847449	3.847511	62
3.847881	3.847943	3.848004	3.848067	3.848128	62
3.848497	3.848559	3.848620	3.848684	3.848745	61
3.849112	3.849171	3.849235	3.849297	3.849358	61
3.849726	3.849788	3.849849	3.849911	3.849972	61
3.850339	3.850401	3.850462	3.850524	3.850585	61
3.850952	3.851014	3.851075	3.851136	3.851197	61
3.851564	3.851625	3.851686	3.851747	3.851809	61
3.852175	3.852236	3.852297	3.852358	3.852419	61
3.852785	3.852846	3.852907	3.852968	3.853029	61
3.853394	3.853455	3.853516	3.853577	3.853637	61
3.854002	3.854063	3.854124	3.854185	3.854245	61
3.854609	3.854670	3.854731	3.854791	3.854852	61
3.855216	3.855277	3.855337	3.855398	3.855458	61
3.855822	3.855882	3.855943	3.856003	3.856064	61
3.856427	3.856487	3.856548	3.856608	3.856668	60
3.857032	3.857091	3.857152	3.857212	3.857272	60

N	0	1	2	3	4
720	3.857332	3.857393	3.857453	3.857513	3.85757
721	3.857933	3.857995	3.858056	3.858116	3.85817
722	3.858537	3.858597	3.858657	3.858718	3.85877
723	3.859138	3.859198	3.859258	3.859318	3.85937
724	3.859739	3.859799	3.859859	3.859918	3.85997
725	3.860338	3.860398	3.860458	3.860518	3.86057
726	3.860937	3.860996	3.861056	3.861116	3.86117
727	3.861534	3.861594	3.861654	3.861714	3.86177
728	3.862131	3.862191	3.862251	3.862310	3.86236
729	3.862728	3.862787	3.862847	3.862906	3.86296
730	3.863323	3.863382	3.863442	3.863501	3.86356
731	3.863917	3.863977	3.864036	3.864096	3.86415
732	3.864511	3.864570	3.864629	3.864689	3.86474
733	3.865104	3.865163	3.865222	3.865282	3.86534
734	3.865696	3.865755	3.865814	3.865874	3.86593
735	3.866287	3.866346	3.866405	3.866465	3.86652
736	3.866878	3.866937	3.866996	3.867055	3.86711
737	3.867467	3.867526	3.867585	3.867644	3.86770
738	3.868056	3.868115	3.868174	3.868233	3.86829
739	3.868643	3.868704	3.868762	3.868821	3.86887
740	3.869238	3.869290	3.869349	3.869408	3.86946
741	3.869818	3.869877	3.869935	3.869994	3.87005
742	3.870404	3.870462	3.870521	3.870579	3.87063
743	3.870989	3.871047	3.871106	3.871164	3.87122
744	3.871573	3.871631	3.871689	3.871748	3.87180
745	3.872156	3.872215	3.872273	3.872331	3.87238
746	3.872739	3.872797	3.872855	3.872913	3.87297
747	3.873321	3.873379	3.873437	3.873495	3.87355
748	3.873902	3.873959	3.874018	3.874076	3.87412
749	3.874482	3.874539	3.874598	3.874656	3.87471
750	3.875061	3.875119	3.875177	3.875235	3.87529
751	3.875639	3.875698	3.875756	3.875813	3.87587
752	3.876218	3.876276	3.876333	3.876391	3.87644
753	3.876795	3.876853	3.876910	3.876968	3.87702
754	3.877371	3.877429	3.877487	3.877544	3.87760
755	3.877947	3.878004	3.878062	3.878119	3.87817
756	3.878522	3.878579	3.878637	3.878694	3.87875
757	3.879096	3.879153	3.879211	3.879268	3.87932
758	3.879669	3.879726	3.879784	3.879841	3.87989
759	3.880242	3.880299	3.880356	3.880413	3.88047

3.857634	3.857694	3.857755	3.857815	3.857875	60
3.858236	3.858297	3.858357	3.858417	3.858477	60
3.858838	3.858898	3.858958	3.859018	3.859078	60
3.859439	3.859499	3.859559	3.859619	3.859679	60
3.860038	3.860098	3.860158	3.860218	3.860278	60
3.860637	3.860697	3.860757	3.860817	3.860877	60
3.861236	3.861295	3.861355	3.861415	3.860475	60
3.861733	3.861893	3.861952	3.862012	3.862072	60
3.862429	3.862489	3.862549	3.862608	3.862662	60
3.863025	3.863085	3.863144	3.863204	3.863263	60
3.863620	3.863679	3.863739	3.863799	3.863858	59
3.864214	3.864274	3.864333	3.864392	3.864452	59
3.864808	3.864867	3.864926	3.864985	3.865045	59
3.865400	3.865459	3.865519	3.865578	3.865637	59
3.865992	3.866051	3.866110	3.866169	3.866228	59
3.866583	3.866642	3.866701	3.866759	3.866819	59
3.867173	3.867232	3.867291	3.867349	3.867409	59
3.867762	3.867821	3.867879	3.867939	3.867998	59
3.868350	3.868409	3.868468	3.868527	3.868586	59
3.868938	3.868997	3.869056	3.869114	3.869173	59
3.869525	3.849584	3.869642	3.829701	3.869759	59
3.870111	3.870169	3.870228	3.870287	3.870345	59
3.870696	3.870755	3.870813	3.870872	3.870930	58
3.871281	3.871339	3.871398	3.871456	3.871515	58
3.871865	3.871923	3.871981	3.872039	3.872098	58
3.872448	3.872506	3.872564	3.872622	3.872681	58
3.873029	3.873088	3.873146	3.873204	3.873262	58
3.873611	3.873669	3.873727	3.873785	3.873844	58
3.874192	3.874249	3.874308	3.874366	3.874424	58
3.874772	3.874829	3.874888	3.874945	3.875003	58
3.875351	3.875400	3.875466	3.875524	3.875582	58
3.875929	3.875987	3.876045	3.876102	3.876160	58
3.876507	3.876564	3.876622	3.876679	3.876737	58
3.877083	3.877141	3.877199	3.877256	3.877314	58
3.877659	3.877717	3.877774	3.877832	3.877889	58
3.878234	3.878292	3.878349	3.878407	3.878464	57
3.878809	3.878866	3.878924	3.878981	3.879039	57
3.879383	3.879439	3.879497	3.879555	3.879612	57
3.879013	3.870013	3.880070	3.880127	3.880185	57
3.880527	3.880585	3.880642	3.880699	3.880756	57

N.	0	1	2	3	4
760	3.8808 14	3.8808 71	3.8809 28	3.8809 85	3.8810 4
761	3.8813 85	3.8814 42	3.8814 99	3.8815 56	3.8816 1
762	3.8819 55	3.8820 12	3.8820 69	3.8821 26	3.8821 8
763	3.8825 25	3.8825 81	3.8826 38	3.8826 95	3.8827 5
764	3.8830 93	3.8830 50	3.8832 07	3.8832 64	3.8833 2
765	3.8836 61	3.8837 18	3.8837 75	3.8838 32	3.8838 8
766	3.8842 29	3.8842 85	3.8843 42	3.8843 99	3.8844 5
767	3.8847 95	3.8848 52	3.8849 09	3.8849 65	3.8850 2
768	3.8853 61	3.8854 18	3.8854 74	3.8855 31	3.8855 8
769	3.8859 26	3.8859 83	3.8860 39	3.8860 96	3.8861 5
770	3.8864 91	3.8865 47	3.8866 04	3.8866 59	3.8867 1
771	3.8870 54	3.8871 11	3.8871 67	3.8872 23	3.8872 7
772	3.8877 17	3.8877 74	3.8877 29	3.8877 86	3.8878 4
773	3.8881 79	3.8882 36	3.8882 92	3.8883 48	3.8884 0
774	3.8887 41	3.8887 97	3.8888 53	3.8889 09	3.8889 6
775	3.8893 02	3.8893 58	3.8894 14	3.8894 69	3.8895 2
776	3.8896 62	3.8899 18	3.8899 74	3.8900 29	3.8900 8
777	3.8904 21	3.8904 77	3.8905 33	3.8905 89	3.8906 4
778	3.8909 79	3.8910 35	3.8910 91	3.8911 47	3.8912 0
779	3.8915 37	3.8915 93	3.8916 49	3.8917 05	3.8917 6
780	3.8920 95	3.8921 50	3.8922 06	3.8922 62	3.8923 1
781	3.8926 51	3.8927 07	3.8927 62	3.8928 19	3.8928 7
782	3.8932 07	3.8932 62	3.8933 18	3.8933 73	3.8934 2
183	3.8937 62	3.8938 17	3.8938 73	3.8939 28	3.8939 8
784	3.8943 16	3.8943 71	3.8944 27	3.8944 82	3.8945 3
785	3.8948 69	3.8949 25	3.8949 80	3.8950 36	3.8950 9
786	3.8954 23	3.8954 78	3.8955 33	3.8955 88	3.8956 4
787	3.8959 75	3.8960 29	3.8960 85	3.8961 40	3.8961 9
788	3.8965 26	3.8965 81	3.8966 36	3.8966 92	3.8967 4
789	3.8970 77	3.8971 32	3.8971 87	3.8972 42	3.8972 9
790	3.8976 27	3.8976 82	3.8977 37	3.8977 92	3.8978 4
791	3.8981 76	3.8982 31	3.8982 86	3.8983 41	3.8983 9
792	3.8987 25	3.8987 80	3.8988 35	3.8988 89	3.8989 4
793	3.8992 73	3.8993 28	3.8993 83	3.8994 37	3.8994 9
794	3.8998 21	3.8998 75	3.8999 29	3.8999 85	3.9000 3
795	3.9003 67	3.9004 22	3.9004 76	3.9005 31	3.9005 8
796	3.9009 13	3.9009 68	3.9010 22	3.9010 77	3.9011 3
797	3.9014 58	3.9015 13	3.9015 67	3.9016 22	3.9016 7
798	3.9020 03	3.9020 57	3.9021 12	3.9021 66	3.9022 2
799	3.9025 47	3.9026 01	3.9026 55	3.9027 09	3.9027 6

5	1	6	1	7	1	8	1	9	
3.881099		3.881156		3.881213		3.881271		3.881328	57
3.881669		3.881727		3.881784		3.881841		3.881898	57
3.882239		3.882297		3.882354		3.882411		3.882468	57
3.882809		3.882866		3.882923		3.882979		3.883037	57
3.883377		3.883434		3.883494		3.883548		3.883605	57
3.883945		3.884002		3.884059		3.884115		3.884172	57
3.884512		3.884569		3.884625		3.884682		3.884739	57
3.885078		3.885135		3.885192		3.885248		3.885305	57
3.885644		3.885700		3.885757		3.885813		3.885869	57
3.886209		3.886265		3.886321		3.886378		3.886434	56
3.886772		3.886829		3.886885		3.886941		3.886998	56
3.887336		3.887392		3.887449		3.887505		3.887561	56
3.887898		3.887955		3.888011		3.888067		3.888123	56
3.888460		3.888516		3.888573		3.888629		3.888685	56
3.889021		3.889077		3.889134		3.889189		3.889246	56
3.889582		3.889638		3.889694		3.889749		3.889806	56
3.890141		3.890197		3.890253		3.890309		3.890365	56
3.890700		3.890756		3.890812		3.890868		3.890924	56
3.891259		3.891314		3.891370		3.891426		3.891482	56
3.891816		3.891872		3.891928		3.891983		3.892039	56
3.892373		3.892429		3.892484		3.892539		3.892595	56
3.892929		3.892985		3.893040		3.893096		3.893151	56
3.893484		3.893539		3.893595		3.893651		3.893706	56
3.894039		3.894094		3.894149		3.894205		3.894261	55
3.894593		3.894648		3.894704		3.894759		3.894814	55
3.895146		3.895201		3.895257		3.895312		3.895367	55
3.895699		3.895754		3.895809		3.895864		3.895919	55
3.896251		3.896306		3.896361		3.896416		3.896471	55
3.896802		3.896857		3.896912		3.896967		3.897022	55
3.897352		3.897407		3.897462		3.897517		3.897572	55
3.897902		3.897957		3.898012		3.898067		3.898122	55
3.898451		3.898506		3.898561		3.898615		3.898670	55
3.898999		3.899054		3.899109		3.899164		3.899218	55
3.899547		3.899602		3.899656		3.899711		3.899766	55
3.900094		3.900149		3.900203		3.900258		3.900312	55
3.900640		3.900695		3.900749		3.900804		3.900859	55
3.901186		3.901240		3.901295		3.901349		3.901404	55
3.901731		3.901785		3.901839		3.901894		3.901948	54
3.902275		3.902329		3.902384		3.902438		3.902492	54
3.902818		3.902873		3.902927		3.902981		3.903036	54

N.	0	1	2	3	4
800	3.903089	3.903144	3.903199	3.903253	3.903307
801	3.903633	3.903687	3.903741	3.903795	3.903849
802	3.904174	3.904229	3.904283	3.904337	3.904391
803	3.904716	3.904769	3.904824	3.904878	3.904932
804	3.905256	3.905310	3.905364	3.905418	3.905472
805	3.905796	3.905849	3.905904	3.905958	3.906012
806	3.906335	3.906389	3.906443	3.906497	3.906551
807	3.906874	3.906927	3.907981	3.907035	3.907089
808	3.907411	3.907465	3.907519	3.907573	3.907626
809	3.907949	3.908002	3.908056	3.908109	3.908163
810	3.908485	3.908539	3.908592	3.908646	3.908699
811	3.909021	3.909074	3.909128	3.909181	3.909235
812	3.909556	3.909609	3.909663	3.909716	3.909769
813	3.910091	3.910144	3.910197	3.910251	3.910304
814	3.910624	3.910678	3.910731	3.910784	3.910838
815	3.911158	3.911211	3.911263	3.911317	3.911371
816	3.911690	3.911743	3.911797	3.911849	3.911903
817	3.912222	3.912275	3.912323	3.912381	3.912435
818	3.912753	3.912806	3.912859	3.912913	3.912966
819	3.913284	3.913337	3.913389	3.913443	3.913496
820	3.913814	3.913867	3.913919	3.913973	3.914026
821	3.914343	3.914396	3.914449	3.914502	3.914555
822	3.914872	3.914925	3.914977	3.915030	3.915083
823	3.915399	3.915453	3.915505	3.915558	3.915611
824	3.915927	3.915979	3.916033	3.916085	3.916138
825	3.916454	3.916507	3.916559	3.916612	3.916664
826	3.916980	3.917033	3.917085	3.917138	3.917190
827	3.917506	3.917558	3.917611	3.917663	3.917716
828	3.918030	3.918083	3.918135	3.918188	3.918240
829	3.918555	3.918607	3.918659	3.918711	3.918764
830	3.919278	3.919130	3.919183	3.919235	3.919287
831	3.919601	3.919653	3.919706	3.919758	3.919810
832	3.920123	3.920176	3.920228	3.920279	3.920332
833	3.920645	3.920697	3.920749	3.920801	3.920853
834	3.921166	3.921218	3.921270	3.921322	3.921374
835	3.921686	3.921738	3.921790	3.921842	3.921894
836	3.922206	3.922258	3.922310	3.922362	3.922414
837	3.922725	3.922777	3.922829	3.922881	3.922933
838	3.923244	3.923296	3.923348	3.923399	3.923451
839	3.923762	3.923814	3.923865	3.923917	3.923969

5	6	7	8	9	
3.903361	3.903416	3.903469	3.903524	3.903578	54
3.903904	3.903956	3.904012	3.904066	3.904120	54
3.904445	3.904499	3.904553	3.904607	3.904661	54
3.904986	3.905039	3.905094	3.905148	3.905202	54
3.905526	3.905580	3.905634	3.905688	3.905742	54
3.906066	3.909119	3.906173	3.906227	3.906281	54
3.906604	3.906658	3.906712	3.906766	3.906819	54
3.907143	3.907196	3.907250	3.907304	3.907358	54
3.907680	3.907734	3.907787	3.907841	3.907895	54
3.908217	3.908270	3.908324	3.908378	3.908431	54
3.908753	3.908807	3.908860	3.908914	3.908967	54
3.909283	3.909342	3.909396	3.909449	3.909503	54
3.909823	3.909877	3.909930	3.909984	3.910037	53
3.910358	3.910411	3.910464	3.910518	3.910571	53
3.910891	3.910944	3.910998	3.911051	3.911104	53
3.911424	3.911477	3.911530	3.911584	3.911637	53
3.911956	3.912009	3.912063	3.912116	3.912169	53
3.912488	3.912541	3.912594	3.912647	3.912700	53
3.913019	3.913072	3.913125	3.913178	3.913231	53
3.913549	3.913602	3.913655	3.913708	3.913761	53
3.914079	3.914132	3.914184	3.914237	3.914290	53
3.914608	3.914660	3.914713	3.914766	3.914816	53
3.915136	3.915189	3.915241	3.915294	3.915347	53
3.915664	3.915716	3.915769	3.915822	3.915875	53
3.916191	3.916243	3.916296	3.916349	3.916401	53
3.916717	3.916769	3.916822	3.916875	3.916927	53
3.917243	3.917295	3.917348	3.917400	3.917453	53
3.917768	3.917820	3.917873	3.917925	3.917978	52
3.918293	3.918345	3.918397	3.918449	3.918502	52
3.918816	3.918869	3.918921	3.918973	3.919026	52
3.919339	3.919392	3.919444	3.919496	3.919549	52
3.919862	3.919914	3.919967	3.920019	3.920071	52
3.920384	3.920436	3.920489	3.920541	3.920593	52
3.920906	3.920958	3.921009	3.921062	3.921114	52
3.921426	3.921478	3.921530	3.921582	3.921634	52
3.921946	3.921998	3.922050	3.922102	3.922154	52
3.922466	3.922518	3.922569	3.922622	3.922674	52
3.922985	3.923037	3.923089	3.923140	3.923192	52
3.923503	3.923555	3.923607	3.923658	3.923710	52
3.924021	3.924072	3.924124	3.924176	3.924228	52

N	0	1	2	3	4
840	3.924279	3.924331	3.924383	3.924434	3.924486
841	3.924796	3.924848	3.924899	3.924951	3.925003
842	3.926312	3.925364	3.925415	3.925467	3.925518
843	3.925828	3.925879	3.925931	3.925982	3.926034
844	3.926342	3.926394	3.926445	3.926497	3.926548
845	3.926857	3.926908	3.926959	3.927011	3.927062
846	3.927370	3.927422	3.927473	3.927524	3.927576
847	3.927883	3.927935	3.927986	3.928037	3.928088
848	3.928396	3.928447	3.928498	3.928549	3.928601
849	3.928908	3.928959	3.929009	3.929061	3.929112
850	3.929419	3.929470	3.929521	3.929572	3.929623
851	3.929929	3.929981	3.930032	3.930083	3.930134
852	3.930439	3.930491	3.930542	3.930592	3.930643
853	3.930949	3.930999	3.931051	3.931102	3.931153
854	3.931458	3.931509	3.931559	3.931610	3.931661
855	3.931966	3.932017	3.932068	3.932118	3.932169
856	3.932474	3.932524	3.932575	3.932626	3.932677
857	3.932988	3.933031	3.933082	3.933133	3.933183
858	3.933487	3.933539	3.933589	3.933639	3.933689
859	3.933992	3.934044	3.934094	3.934145	3.934195
860	3.934498	3.934549	3.934599	3.934649	3.934700
861	3.935003	3.935056	3.935104	3.935154	3.935205
862	3.935507	3.935558	3.935608	3.935658	3.935709
863	3.936011	3.936061	3.936111	3.936162	3.936212
864	3.936514	3.936564	3.936614	3.936665	3.936715
865	3.937016	3.937066	3.937117	3.937167	3.937217
866	3.937518	3.937568	3.937618	3.937668	3.937718
867	3.938019	3.938069	3.938119	3.938169	3.938219
868	3.938519	3.938569	3.938619	3.938669	3.938719
869	3.939019	3.939069	3.939119	3.939169	3.939219
870	3.939519	3.939569	3.939619	3.939669	3.939719
871	3.940018	3.940068	3.940118	3.940168	3.940218
872	3.940516	3.940566	3.940616	3.940666	3.940716
873	3.941014	3.941065	3.941114	3.941163	3.941213
874	3.941511	3.941561	3.941611	3.941660	3.941710
875	3.942008	3.942058	3.942107	3.942157	3.942207
876	3.942504	3.942554	3.942603	3.942653	3.942702
877	3.942999	3.943049	3.943099	3.943148	3.943198
878	3.943495	3.943544	3.943594	3.943643	3.943692
879	3.943989	3.944038	3.944088	3.944137	3.944186

3.924538	3.924589	3.924641	3.924693	3.924744	52
3.925054	3.925106	3.925157	3.925209	3.925261	52
3.925569	3.925621	3.925673	3.925725	3.925776	52
3.926085	3.926137	3.926188	3.926239	3.926291	51
3.926599	3.926651	3.926702	3.926754	3.926805	51
3.927114	3.927165	3.927216	3.927268	3.927319	51
3.927627	3.927678	3.927729	3.927781	3.927832	51
3.928139	3.928191	3.928242	3.928293	3.928345	51
3.928652	3.928703	3.928754	3.928805	3.928857	51
3.929163	3.929215	3.929266	3.929317	3.929368	51
3.929674	3.929725	3.929776	3.929827	3.929879	51
3.930185	3.930236	3.930287	3.930338	3.930389	51
3.930694	3.930745	3.930796	3.930847	3.930898	51
3.931204	3.931254	3.931305	3.931356	3.931407	51
3.931712	3.931763	3.931814	3.931865	3.931915	51
3.932220	3.932271	3.932322	3.932372	3.932423	51
3.932727	3.932778	3.932829	3.932879	3.932930	51
3.933234	3.933285	3.933335	3.933386	3.933437	51
3.933740	3.933791	3.933841	3.933892	3.933943	51
3.934246	3.934296	3.934347	3.934397	3.934448	51
3.934751	3.934801	3.934852	3.934902	3.934953	50
3.935255	3.935306	3.935356	3.935406	3.935457	50
3.935759	3.935809	3.935859	3.935910	3.935960	50
3.936262	3.936313	3.936363	3.936413	3.936463	50
3.936765	3.936815	3.936865	3.936916	3.936966	50
3.937268	3.937317	3.937367	3.937418	3.937468	50
3.937769	3.937819	3.937869	3.937919	3.937969	50
3.938269	3.938319	3.938369	3.938419	3.938469	50
3.938769	3.938819	3.938869	3.938919	3.938969	50
3.939269	3.939319	3.939369	3.939419	3.939469	50
3.939769	3.939819	3.939869	3.939919	3.939969	50
3.940267	3.940317	3.940367	3.940417	3.940467	50
3.940765	3.940813	3.940865	3.940915	3.940964	50
3.941263	3.941313	3.941362	3.941412	3.941462	50
3.941759	3.941809	3.941859	3.941909	3.941958	50
3.942256	3.942306	3.942355	3.942405	3.942455	50
3.942752	3.942801	3.942851	3.942901	3.942950	50
3.943247	3.943297	3.943346	3.943396	3.643445	49
3.943742	3.943791	3.943841	3.943890	3.943939	49
3.944236	3.944285	3.944335	3.944384	3.944433	49

N.	0	1	2	3	4
880	3.944483	3.944532	3.944581	3.944631	3.944680
881	3.944976	3.945025	3.945074	3.945124	3.945173
882	3.945468	3.945518	3.945567	3.945616	3.945665
883	3.945961	3.946009	3.946054	3.946108	3.946157
884	3.946452	3.946501	3.946551	3.946599	3.946649
885	3.946943	3.946992	3.947041	3.947090	3.947139
886	3.947434	3.947483	3.947532	3.947581	3.947629
887	3.947924	3.947973	3.948022	3.948070	3.948119
888	3.948413	3.948462	3.948511	3.948559	3.948609
889	3.948902	3.948951	3.948999	3.949048	3.949097
890	3.949390	3.949439	3.949488	3.949536	3.949585
891	3.949878	3.949926	3.949975	3.950024	3.950073
892	3.950365	3.950414	3.950462	3.950511	3.950559
893	3.950851	3.950900	3.950949	3.950997	3.951046
894	3.951338	3.951386	3.951435	3.951483	3.951532
895	3.951823	3.951872	3.951920	3.951969	3.952017
896	3.952308	3.952356	3.952405	3.952453	3.952502
897	3.952792	3.952841	3.952889	3.952938	3.952986
898	3.953276	3.953325	3.953373	3.953421	3.953469
899	3.953759	3.953808	3.953856	3.953905	3.953953
900	3.954243	3.954291	3.954339	3.954387	3.954435
901	3.954725	3.954773	3.954821	3.954869	3.954918
902	3.955207	3.955255	3.955303	3.955351	3.955399
903	3.955688	3.955736	3.955784	3.955832	3.955880
904	3.956168	3.956216	3.956265	3.956313	3.956361
905	3.956640	3.956697	3.956745	3.956793	3.956840
906	3.957128	3.957176	3.957224	3.957272	3.957319
907	3.957607	3.957655	3.957703	3.957751	3.957799
908	3.958086	3.958134	3.958181	3.958229	2.958277
909	3.958564	3.958612	3.958659	3.958707	3.958755
910	3.959041	3.959089	3.959137	3.959185	3.959232
911	3.959518	3.959566	3.959614	3.959661	3.959709
912	3.959995	3.960042	3.960090	3.960138	3.960185
913	3.960471	3.960518	3.960566	3.960613	3.960661
914	3.960946	3.960994	3.961041	3.961089	3.961136
915	3.961421	3.961469	3.961516	3.961563	3.961611
916	3.961895	3.961943	3.961990	3.962038	3.962085
917	3.962369	3.962417	3.962464	3.962511	3.962559
918	3.962842	3.962889	3.962937	3.962985	3.963032
919	3.963315	3.963362	3.963410	3.963457	3.963504

3.944729	3.944779	3.944828	3.944877	3.944927	49
3.945222	3.945272	3.945321	3.945370	3.945419	49
3.945715	3.945764	3.945813	3.945862	3.945912	49
3.946207	3.946256	3.946305	3.946354	3.946403	49
3.946698	3.946747	3.946796	3.946845	3.946894	49
3.947189	3.947238	3.947287	3.947336	3.947385	49
3.947679	3.947728	3.947777	3.947826	3.947875	49
3.948168	3.948217	3.948266	3.948315	3.648364	49
3.948657	3.948706	3.948755	3.948804	3.948853	49
3.949146	3.949195	3.949244	3.949292	3.949341	49
3.949633	3.949683	3.949731	3.949780	3.949829	49
3.950121	3.950170	3.950219	3.950267	3.950316	49
3.950608	3.950657	3.950706	3.950754	3.950803	49
3.951095	3.951143	3.951192	3.951240	3.951289	49
3.951580	3.951629	3.951677	3.951729	3.951775	49
3.952066	3.952114	3.952163	3.952211	3.952259	49
3.952550	3.952599	3.952647	3.952696	3.952744	48
3.953034	3.953083	3.953131	3.953179	3.953228	48
3.953518	3.953566	3.953615	3.953663	3.953711	48
3.954001	3.954049	3.954099	3.954146	3.954194	48
3.954434	3.954532	3.954580	3.954628	3.954677	48
3.954966	3.955014	3.955062	3.955110	3.955158	48
3.955447	3.955495	3.955543	3.955592	3.955639	48
3.955928	3.955976	3.956024	3.956072	3.956120	48
3.956409	3.956457	3.956505	3.956553	3.956601	48
3.956888	3.956936	3.956984	3.957032	3.957080	48
3.957368	3.957716	3.957464	3.957512	3.957559	48
3.957847	3.957894	3.957942	3.957990	3.958038	48
3.958325	3.958373	3.958421	3.958468	3.958516	48
3.958803	3.958850	3.958898	3.958946	3.958994	48
3.959279	3.959328	3.959375	3.959423	3.959471	48
3.959757	3.959804	3.959852	3.959899	3.959947	48
3.960233	3.960280	3.960328	3.960376	3.960423	48
3.960709	3.960756	3.960804	3.960851	3.960899	48
3.961184	3.961231	3.961279	3.961326	3.961374	47
3.961658	3.961706	3.961753	3.961801	3.961848	47
3.962132	3.962179	3.962227	3.962275	3.962322	47
3.962606	3.962653	3.962701	3.962748	3.962795	47
3.963079	3.963126	3.963174	3.963228	3.963268	47
3.963552	3.963599	3.963646	3.963693	3.963741	47

N.	0	1	2	3	4
920	3.963788	3.963839	3.963882	3.963929	3.963977
921	3.964259	3.964307	3.964354	3.964401	3.964448
922	3.964731	3.964778	3.964825	3.964872	3.964919
923	3.965202	3.965249	3.965296	3.965343	3.965389
924	3.965672	3.965719	3.965766	3.965813	3.965859
925	3.966142	3.966189	3.966239	3.966283	3.966329
926	3.966611	3.966658	3.966705	3.966752	3.966799
927	3.967079	3.967127	3.967173	3.967220	3.967267
928	3.967548	3.967595	3.967642	3.967688	3.967735
929	3.968016	3.968062	3.968109	3.968156	3.968202
930	3.968483	3.968529	3.968576	3.968623	3.968669
931	3.968949	3.968996	3.969043	3.969089	3.969136
932	3.969416	3.969463	3.969509	3.969556	3.969602
933	3.969882	3.969928	3.969975	3.970021	3.970068
934	3.970347	3.970393	3.970439	3.970486	3.970533
935	3.970812	3.970858	3.970904	3.970951	3.970997
936	3.971276	3.971322	3.971369	3.971416	3.971461
937	3.971739	3.971786	3.971832	3.971879	3.971925
938	3.972203	3.972249	3.972295	3.972342	3.972388
939	3.972666	3.972712	3.972578	3.972804	3.972851
940	3.973128	3.973174	3.973220	3.973266	3.973313
941	3.973589	3.973636	3.973682	3.973728	3.973774
942	3.974050	3.974097	3.974143	3.974189	3.974236
943	3.974512	3.974558	3.974604	3.974649	3.974695
944	3.974972	3.975018	3.975074	3.975109	3.975156
945	3.975432	3.975478	3.975524	3.975569	3.975616
946	3.975891	3.975937	3.975983	3.976029	3.976075
947	3.976349	3.976396	3.976442	3.976488	3.976533
948	3.976808	3.976854	3.976899	3.976946	3.976992
949	3.977266	3.977312	3.977358	3.977403	3.977449
950	3.977724	3.977769	3.977815	3.977861	3.977906
951	3.978181	3.978226	3.978272	3.978317	3.978363
952	3.978637	3.978683	3.978728	3.978774	3.978819
953	3.979093	3.979138	3.979184	3.979229	3.979275
954	3.979548	3.979594	3.979639	3.979685	3.979730
955	3.980003	3.980049	3.980094	3.980139	3.980185
956	3.980458	3.980503	3.980549	3.980594	3.980639
957	3.980912	3.980957	3.981003	3.981048	3.981093
958	3.981366	3.981411	3.981456	3.981501	3.981547
959	3.981819	3.981864	3.981909	3.981954	3.981999

3.964024	3.964071	3.964118	3.964165	3.964212	47
3.964495	3.964542	3.964589	3.964637	3.964684	47
3.964966	3.965013	3.965061	3.965108	3.965156	47
3.965437	3.965484	3.965531	3.965578	3.965624	47
3.965906	3.965954	3.966001	3.966048	3.966096	47
3.966376	3.966423	3.966470	3.966517	3.966564	47
3.966845	3.966892	3.966939	3.966986	3.967033	47
3.967314	3.967361	3.967408	3.967454	3.967501	47
3.967782	3.967829	3.967875	3.967922	3.967969	47
3.968249	3.968296	3.968343	3.968389	3.968436	47
3.968716	3.968762	3.968809	3.968856	3.968902	47
3.969183	3.969229	3.969276	3.969323	3.969369	47
3.969649	3.969695	3.969741	3.969789	3.969835	47
3.970114	3.970161	3.970207	3.970254	3.970300	47
3.970579	3.970626	3.970672	3.970719	3.970765	46
3.971044	3.971090	3.971137	3.971183	3.971229	46
3.971508	3.971554	3.971601	3.971647	3.971653	46
3.971971	3.972018	3.972064	3.972110	3.972157	46
3.972434	3.972481	3.972507	3.972573	3.972619	46
3.972897	3.972943	3.972989	3.973036	3.973082	46
3.973359	3.973405	3.973451	3.973497	3.973543	46
3.973820	3.973866	3.973913	3.973959	3.974005	46
3.974281	3.974327	3.974374	3.974419	3.974466	46
3.974742	3.974788	3.974834	3.974879	3.974926	46
3.975202	3.975248	3.975294	3.975339	3.975386	46
3.975662	3.975707	3.975753	3.975799	3.975845	46
3.976121	3.976167	3.976212	3.976258	3.976304	46
3.976579	3.976625	3.976671	3.976717	3.676763	46
3.977037	3.977083	3.977129	3.977175	3.977220	46
3.977495	3.977541	3.977586	3.977632	3.977678	46
3.977952	3.977998	3.978043	3.978089	3.978135	46
3.978409	3.978454	3.978500	3.978546	3.978591	46
3.978865	3.978911	3.978956	3.979002	3.979047	46
3.979321	3.979366	3.979412	3.979457	3.979503	46
3.979776	3.979821	3.979867	3.979912	3.979958	46
3.980231	3.980276	3.980322	3.980367	3.980412	45
3.980685	3.980730	3.980776	3.980821	3.980867	45
3.981139	3.981184	3.981229	3.981275	3.981320	45
3.981592	3.981637	3.981683	3.981728	3.981773	45
3.982045	3.982090	3.982135	3.982181	3.982226	45

N.	0	1	2	3	4
960	3.982271	3.982316	3.982362	3.982407	3.982452
961	3.982723	3.982767	3.982812	3.982859	3.982904
962	3.983175	3.983220	3.983265	3.983310	3.983356
963	3.983626	3.983671	3.983716	3.983762	3.983807
964	3.984077	3.984122	3.984167	3.984212	3.984257
965	3.984527	3.984572	3.984617	3.984662	3.984707
966	3.984977	3.985021	3.985067	3.985112	3.985157
967	3.985426	3.985471	3.985516	3.985561	3.985606
968	3.985875	3.985920	3.985965	3.986009	2.986055
969	3.986324	3.986369	3.986413	3.986458	3.986504
970	3.986772	3.986817	3.986861	3.986906	3.986951
971	3.987219	3.987264	3.987309	3.987353	3.987398
972	3.987666	3.987711	3.987756	3.987800	3.987845
973	3.988113	3.988157	3.988201	3.988247	3.988291
974	3.988559	3.988604	3.988648	3.988693	3.988737
975	3.989005	3.989049	3.989094	3.989138	3.989183
976	3.989449	3.989494	3.989539	3.989584	3.989628
977	3.989895	3.989939	3.989983	3.990028	3.990072
978	3.990339	3.990383	3.990428	3.990472	3.990516
979	3.990783	3.990827	3.990871	3.990916	3.990960
980	3.991226	3.991270	3.991315	3.991359	3.991403
981	3.991669	3.991713	3.991758	3.991802	3.991846
982	3.992111	3.992156	3.992109	3.992244	3.992288
983	3.992554	3.992598	3.992642	3.992686	3.992730
984	3.992995	3.993039	3.993083	3.993127	3.993172
985	3.993436	3.993480	3.993524	3.993568	3.993613
986	3.993877	3.993921	3.993965	3.994009	3.994053
985	3.994317	3.994361	3.994405	3.994449	3.994493
988	3.994756	3.994801	3.994845	3.994889	3.994933
989	3.995196	3.995240	3.995284	3.995328	3.995372
990	3.995635	3.995679	3.995723	3.995764	3.995811
991	3.996074	3.996117	3.996161	3.996205	3.996249
992	3.996512	3.996555	3.996599	3.996643	3.996687
993	3.996949	3.996993	3.997037	3.997080	3.997124
994	3.997386	3.997430	3.997474	3.997517	3.997561
995	3.997823	3.997867	3.997910	3.997954	3.997998
996	3.998259	3.998303	3.998347	3.998390	3.998434
997	3.998695	3.998739	3.998783	3.998826	3.998869
998	3.999133	3.999174	3.999218	3.999261	3.999305
999	3.999565	3.999609	3.999652	3.999696	3.999739

5	6	7	8	9	D.
3.982497	3.982543	3.982588	3.982633	3.982678	45
3.982949	3.982994	3.983039	3.983085	3.983129	45
3.983401	3.983446	3.983490	3.983536	3.983581	45
3.983852	3.983897	3.983942	3.983987	3.984032	45
3.984302	3.984347	3.984392	3.984437	3.984482	45
3.984752	3.984797	3.984842	3.984887	3.984932	45
3.985202	3.985247	3.985292	3.985337	3.985382	45
3.985651	3.985696	3.985741	3.985786	3.985830	45
3.986099	3.986144	3.986189	3.986234	3.986279	45
3.986548	3.986593	3.986637	3.986682	3.986727	45
3.986996	3.987040	3.987085	3.987129	3.987175	45
3.987443	3.987488	3.987532	3.987577	3.987622	45
3.987889	3.987934	3.987979	3.988024	3.988068	45
3.988336	3.988381	3.988425	3.988469	3.988514	45
3.988782	3.988826	3.988871	3.988916	3.988960	45
3.989227	3.989272	3.989316	3.989361	3.989405	45
3.989672	3.989717	3.989761	3.989806	3.989850	44
3.990117	3.990161	3.990206	3.990250	3.990294	44
3.990561	3.990605	3.990649	3.990694	3.990738	44
3.991004	3.991049	3.991093	3.991137	3.991182	44
3.991448	3.991492	3.991536	3.991580	3.991625	44
3.991890	3.991935	3.991979	3.992023	3.992067	44
3.992333	3.992377	3.992421	3.992465	3.992509	44
3.992774	3.992819	3.992863	3.992907	3.992951	44
3.993216	3.993259	3.993304	3.993348	3.993392	44
3.993657	3.993701	3.993745	3.993789	3.993833	44
3.994097	3.994141	3.994185	3.994229	3.994273	44
3.994537	3.994581	3.994625	3.994669	3.994713	44
3.994977	3.995021	3.995065	3.995108	3.995152	44
3.995416	3.995459	3.995504	3.995547	3.995591	44
3.995854	3.995898	3.995942	3.995986	3.996029	44
3.996293	3.996337	3.996380	3.996424	3.996468	44
3.996731	3.996774	3.996818	3.996862	3.996906	44
3.997168	3.997212	3.997255	3.997299	3.997343	44
3.997605	3.997648	3.997692	3.997736	3.997779	44
3.998041	3.998085	3.998129	3.998172	3.998216	44
3.998477	3.998521	3.998564	3.998608	3.998652	44
3.998913	3.998956	3.998999	3.999043	3.999087	44
3.999348	3.999392	3.999435	3.999479	3.999522	44
3.999783	3.999826	3.999866	3.999913	3.999956	43

TABULA PARTIUM PROPORTIONALIUM,

Cujus ope & Tabulæ Logarithmorum precedentium, omnium numerorum Logarithmi per Additionem;

Et omnium Logarithmorum numeri usque ad 100.000 per Subductionem inveniantur.

Q.	1	2	3	4	5	6	7	8	9
43	4	8	13	17	21	25	30	34	38
44	4	8	13	17	22	26	30	35	39
45	4	9	13	18	22	27	31	36	40
46	4	9	13	18	23	27	32	36	41
47	4	9	14	18	23	28	32	37	42
48	4	9	14	19	24	28	33	38	43
49	4	9	14	19	24	29	34	39	44
50	5	10	15	20	25	30	35	40	45
51	5	10	15	20	25	30	35	40	45
52	5	10	15	20	26	31	36	41	46
53	5	10	15	21	26	31	37	42	47
54	5	10	16	21	27	32	37	43	48
55	5	11	16	22	27	33	38	44	49
56	5	11	16	22	28	33	39	44	50
57	5	11	17	22	28	34	39	45	51
58	5	11	17	23	29	34	40	46	52
59	5	11	17	23	29	35	41	47	53
60	6	12	18	24	30	36	42	48	54
61	6	12	18	24	30	36	42	48	54
62	6	12	18	24	31	37	43	49	55
63	6	12	18	25	31	37	44	50	56
64	6	12	19	25	32	38	44	51	57
65	6	13	19	26	32	39	45	52	58
66	6	13	19	26	33	39	46	52	59
67	6	13	20	26	33	40	46	53	60
68	6	13	20	27	34	40	47	54	61
69	6	13	20	27	34	41	48	55	62
70	7	14	21	28	35	42	49	56	63
71	7	14	21	28	35	42	49	56	63
72	7	14	21	28	36	43	50	57	64
73	7	14	21	29	36	43	51	58	65
74	7	14	22	29	37	44	51	59	66
75	7	15	22	30	37	45	52	60	67
76	7	15	22	30	38	45	53	60	68
77	7	15	23	30	38	46	53	61	69
78	7	15	23	31	39	46	54	62	70
79	7	15	23	31	39	47	55	63	71
80	8	16	24	32	40	48	56	64	72
81	8	16	24	32	40	48	56	64	72
82	8	16	24	32	41	49	57	65	73

D.	1	2	3	4	5	6	7	8	9
83	8	16	24	33	41	49	58	66	74
84	8	16	25	33	42	50	58	67	75
85	8	17	25	34	42	51	59	68	76
86	8	17	25	34	43	51	60	68	77
87	8	17	26	34	43	52	60	69	78
88	8	17	26	35	44	52	61	70	79
89	8	17	26	35	44	53	62	71	80
90	9	18	27	36	45	54	63	72	81
91	9	18	27	36	45	54	63	72	81
92	9	18	27	36	46	55	64	73	82
93	9	18	27	37	46	55	65	74	83
94	9	18	28	37	47	56	65	75	84
95	9	19	28	38	47	57	66	76	85
96	9	19	28	38	48	57	67	76	86
97	9	19	29	38	48	58	67	77	87
98	9	19	29	39	49	58	68	78	88
99	9	19	29	39	49	59	69	79	89
100	10	20	30	40	50	60	70	80	90
101	10	20	30	40	50	60	70	80	90
102	10	20	30	40	51	61	71	81	91
103	10	20	30	41	51	61	72	82	92
104	10	20	31	41	52	62	72	83	93
105	10	21	31	42	52	63	73	84	94
106	10	21	31	42	53	63	74	84	95
107	10	21	32	42	53	64	74	85	96
108	10	21	32	43	54	64	75	86	97
109	10	21	32	43	54	65	76	87	98
110	11	22	33	44	55	66	77	88	99
111	11	22	33	44	55	66	77	88	99
112	11	22	33	44	56	67	78	89	100
113	11	22	33	45	57	67	78	90	101
114	11	22	34	45	57	68	79	91	102
115	11	23	34	46	57	69	80	92	103
116	11	23	34	46	58	69	81	92	104
117	11	23	35	46	58	70	81	93	105
118	11	23	35	47	59	70	82	94	106
119	11	23	35	47	59	71	83	95	107
120	12	24	36	48	60	72	84	96	108
121	12	24	36	48	60	72	84	96	108
122	12	24	36	48	61	73	85	97	109

D.	1	2	3	4	5	6	7	8	9
123	12	24	36	48	61	73	86	98	110
124	12	24	37	49	62	74	86	99	112
125	12	25	37	50	62	75	87	100	112
126	12	25	37	50	63	75	88	100	113
127	12	25	38	50	63	76	88	101	114
128	12	25	38	51	64	76	89	102	115
129	12	25	38	51	64	77	90	103	116
130	13	26	39	52	65	78	91	104	117
131	13	26	39	52	65	78	91	104	117
132	13	26	39	52	66	79	92	105	118
133	13	26	39	53	66	79	93	106	119
134	13	26	40	53	67	80	93	107	120
135	13	27	40	54	67	81	94	108	121
136	13	27	40	54	68	81	95	108	122
137	13	27	41	54	68	82	95	109	123
138	13	27	41	55	69	82	96	110	124
139	13	27	41	55	69	83	97	111	125
140	14	28	42	56	70	84	98	112	126
141	14	28	42	56	70	84	99	112	126
142	14	28	42	56	71	83	99	113	127
143	14	28	42	57	71	85	100	114	128
144	14	28	43	57	72	86	100	115	129
145	14	28	43	58	72	87	101	116	130
146	14	29	43	58	73	87	102	116	131
147	14	29	44	58	73	88	103	117	132
148	14	29	44	59	74	88	103	118	133
149	14	29	44	59	74	89	104	119	134
150	15	30	45	60	75	90	105	120	135
151	15	30	45	60	75	90	105	120	135
152	15	30	45	60	76	91	106	121	136
153	15	30	45	60	76	91	107	122	137
154	15	30	46	61	77	92	107	123	138
155	15	31	46	62	77	93	108	124	139
156	15	31	46	62	78	93	109	124	140
157	15	31	47	62	78	94	109	125	141
158	15	31	47	63	79	94	110	126	142
159	15	31	47	63	79	95	111	127	143
160	16	32	48	64	80	96	112	128	144
161	16	32	48	64	80	96	112	128	144
162	16	32	48	64	81	97	113	129	145

D.	1	2	3	4	5	6	7	8	9
163	16	32	48	65	82	98	114	130	146
164	16	32	49	66	82	98	114	131	147
165	16	33	49	66	82	99	115	132	148
166	16	33	49	66	83	99	116	132	149
167	16	33	50	66	83	100	116	133	150
168	16	33	50	67	84	100	117	134	151
169	16	33	50	67	84	101	118	135	152
170	17	34	51	68	85	102	119	136	153
171	17	34	51	68	85	102	119	136	153
172	17	34	51	68	86	103	120	137	154
173	17	34	51	69	86	103	121	138	155
174	17	34	52	69	87	104	121	139	156
175	17	34	52	70	87	105	122	140	157
176	17	35	52	70	88	105	123	140	158
177	17	35	53	70	88	106	123	141	159
178	17	35	53	71	89	106	124	142	160
179	17	35	53	71	89	107	125	143	161
180	18	36	54	72	90	108	126	144	162
181	18	36	54	72	90	108	126	144	162
182	18	36	54	72	91	109	127	145	163
183	18	36	54	73	91	109	128	146	164
184	18	36	55	73	92	110	128	147	165
185	18	37	55	74	92	111	129	148	166
186	18	37	55	74	93	111	130	148	167
187	18	37	56	74	93	112	130	149	168
188	18	37	56	75	94	112	131	150	169
189	18	37	56	75	94	113	132	151	170
190	19	38	57	76	96	114	133	152	171
191	19	38	57	76	95	114	133	152	171
192	19	38	57	76	96	115	134	153	172
193	19	38	57	77	96	115	135	154	173
194	19	38	58	77	97	116	135	155	174
195	19	39	58	78	97	117	136	156	175
196	19	39	59	78	98	117	136	156	176
197	19	39	59	78	98	118	137	157	177
198	19	39	59	79	99	118	138	158	178
199	19	39	59	79	99	119	139	159	179
200	20	40	60	80	100	120	140	160	180
201	20	40	60	80	100	120	140	160	180
202	20	40	60	80	101	121	141	161	181

De	1	2	3	4	5	6	7	8	9
103	20	40	60	81	101	121	142	162	182
104	20	40	61	81	102	122	142	163	183
105	20	41	61	82	102	123	143	164	184
106	20	41	61	82	103	123	144	164	185
107	20	41	62	82	103	124	144	165	186
108	20	41	62	83	104	124	145	166	187
109	20	41	62	83	104	125	146	167	188
110	21	42	63	84	105	126	147	168	189
111	21	42	63	84	105	126	147	168	189
112	21	42	63	84	106	127	148	169	190
113	21	42	63	85	106	127	149	170	191
114	21	42	64	85	107	128	149	171	192
115	21	43	64	86	107	129	150	172	193
116	21	43	64	86	108	129	151	172	194
117	21	43	65	86	108	130	151	173	195
118	21	43	65	87	109	130	152	174	196
119	21	43	65	87	109	131	153	175	197
120	22	44	66	88	110	132	154	176	198
121	22	44	66	88	110	132	154	176	198
122	22	44	66	88	111	133	155	177	199
123	22	44	66	89	111	133	156	178	200
124	22	44	67	89	112	134	156	179	201
125	22	45	67	90	112	135	157	180	202
126	22	45	67	90	113	135	158	180	203
127	22	45	68	90	113	136	158	181	204
128	22	45	68	91	114	136	159	182	205
129	22	45	68	91	114	137	160	183	206
130	23	46	69	92	115	138	161	184	207
131	23	46	69	92	115	138	161	184	207
132	23	46	69	92	116	139	162	185	208
133	23	46	69	93	116	139	163	186	209
134	23	46	70	93	117	140	163	187	210
135	23	47	70	94	117	141	164	188	211
136	23	47	70	94	118	141	165	188	212
137	23	47	71	94	118	142	165	189	213
138	23	47	71	95	119	142	166	190	214
139	23	47	71	95	119	143	167	191	215
140	24	48	72	96	120	144	168	192	216
141	24	48	72	96	120	144	168	192	216
142	24	48	72	96	121	145	169	193	217

D.	1	2	3	4	5	6	7	8	9
243	24	48	72	97	121	145	170	194	218
244	24	48	73	97	122	146	170	195	219
245	24	49	73	98	122	147	171	196	210
246	24	49	73	98	123	147	172	196	221
247	24	49	74	98	123	148	172	197	222
248	24	49	74	99	124	148	173	198	223
249	24	49	74	99	124	149	174	199	224
250	25	50	75	100	125	150	175	200	225
251	25	50	75	100	125	150	175	200	225
252	25	50	75	100	126	151	176	201	226
253	25	50	75	101	126	151	177	202	227
254	25	50	76	101	127	152	177	203	228
255	25	50	76	102	127	153	178	204	229
256	25	51	76	102	128	153	179	204	230
257	25	51	77	102	128	154	179	205	231
258	25	51	77	103	129	154	180	206	232
259	25	51	77	103	129	155	181	207	233
260	26	52	78	104	130	156	182	208	234
261	26	52	78	104	130	156	182	208	234
262	26	52	78	104	131	156	183	209	235
263	26	52	78	105	131	157	184	210	236
264	26	52	79	105	132	158	184	211	237
265	26	53	79	106	132	159	185	212	238
266	26	53	79	106	133	159	186	212	239
267	26	53	80	106	133	160	186	213	240
268	26	53	80	107	134	160	187	214	241
269	26	53	80	107	134	161	188	215	242
270	27	54	81	108	135	162	189	216	243
271	27	54	81	108	135	162	189	216	243
272	27	54	81	108	136	163	190	217	244
273	27	54	81	109	136	163	191	218	245
274	27	54	82	109	137	164	191	219	246
275	27	55	82	110	137	165	192	220	247
276	27	55	82	110	138	165	193	220	248
277	27	55	83	110	138	166	193	221	249
278	27	55	83	111	139	166	194	222	250
279	27	55	83	111	139	167	195	223	751
280	28	56	84	112	140	168	196	224	252
281	28	56	84	112	140	168	196	224	252
282	28	56	84	112	141	169	197	225	653

D.	1	2	3	4	5	6	7	8	9
283	28	56	84	113	141	169	198	226	254
284	28	56	85	113	141	170	198	227	255
285	28	57	85	114	142	171	199	228	256
286	28	57	85	114	143	171	200	228	257
287	28	57	86	114	143	172	200	229	258
288	28	57	86	115	144	172	201	230	259
289	28	57	86	115	144	173	202	231	260
290	29	58	87	116	145	174	203	232	261
291	29	58	87	116	145	174	203	232	261
292	29	58	87	116	146	174	204	233	262
293	29	58	87	117	146	175	204	234	263
294	29	58	88	117	147	176	205	235	264
295	29	59	88	118	147	177	206	236	265
296	29	59	88	118	148	177	207	236	266
297	29	59	88	118	148	178	207	237	267
298	29	59	89	119	149	178	208	238	268
299	29	59	89	119	149	179	209	239	269
300	30	60	90	120	150	180	210	240	270
301	30	60	90	120	150	180	210	240	270
302	30	60	90	120	151	181	211	241	271
303	30	60	90	121	151	181	212	242	272
304	30	60	91	121	152	182	212	243	273
305	30	61	91	122	152	183	213	244	274
306	30	61	91	122	153	183	214	244	175
307	30	61	92	122	153	184	214	245	276
308	30	61	92	123	154	184	215	246	277
309	30	61	92	123	154	185	216	247	278
310	31	62	93	124	155	186	217	248	279
311	31	62	93	124	155	186	217	248	279
312	31	62	93	124	156	187	218	249	280
313	31	62	93	125	156	187	219	250	281
314	31	62	94	125	157	188	219	251	282
315	31	63	94	126	157	189	220	252	283
316	31	63	94	126	158	189	221	252	284
317	31	63	95	126	158	190	221	253	285
318	31	63	95	127	159	190	222	254	286
319	31	63	95	127	159	191	223	255	287
320	32	64	96	128	160	192	224	256	288
321	32	64	96	128	160	192	224	256	288
322	32	64	96	128	161	193	225	257	289

D.	1	2	3	4	5	6	7	8	9
323	32	64	96	129	161	193	226	258	290
324	32	64	97	129	162	194	226	259	291
325	32	65	97	130	162	195	227	260	292
326	32	65	97	130	163	195	228	260	293
327	32	65	98	130	163	196	228	261	294
328	32	65	98	131	163	196	229	261	295
329	32	65	98	131	164	197	230	263	296
330	33	66	99	132	165	198	231	264	297
331	33	66	99	132	165	198	231	264	297
332	33	66	99	132	166	199	232	265	298
333	33	66	99	133	166	199	233	266	299
334	33	66	100	133	167	200	233	267	300
335	33	67	100	134	167	201	234	268	301
336	33	67	100	134	168	201	235	268	302
337	33	67	101	134	168	202	235	269	303
338	33	67	101	135	169	202	236	270	304
339	33	67	101	135	169	203	237	271	305
340	34	68	102	136	170	204	238	272	306
341	34	68	102	136	170	204	238	272	306
342	34	68	102	136	171	205	239	273	307
343	34	68	102	137	171	205	240	274	308
344	34	68	103	137	172	206	240	275	309
345	34	69	103	138	172	207	241	276	310
346	34	69	103	138	173	207	242	276	311
347	34	69	104	138	173	208	242	277	312
348	34	69	104	139	174	208	243	278	313
349	34	69	104	139	174	209	244	279	314
350	34	70	105	140	175	210	245	280	315
351	35	70	105	140	175	210	245	280	315
352	35	70	105	140	176	211	246	281	316
353	35	70	105	141	176	211	247	282	317
354	35	70	106	141	177	212	247	283	318
355	35	71	106	142	177	213	248	284	319
356	35	71	106	142	178	213	249	284	320
357	35	71	107	142	178	214	249	285	321
358	35	71	107	143	179	214	250	286	322
359	35	71	107	143	179	215	251	287	323
360	36	72	108	144	180	216	252	288	324
361	36	72	108	144	180	216	252	288	324
362	36	72	108	144	181	217	253	289	325

D.	1	2	3	4	5	6	7	8	9
63	36	72	108	145	181	217	254	290	326
64	36	72	109	145	182	218	254	291	327
65	36	73	109	146	182	219	255	292	328
66	36	73	109	146	182	219	256	292	329
67	36	73	110	146	183	220	256	293	330
68	36	73	110	147	184	220	257	294	331
69	36	73	110	147	184	221	258	295	332
70	37	74	111	148	185	222	259	296	333
71	37	74	111	148	185	222	259	296	333
72	37	74	111	148	186	223	260	297	334
73	37	74	111	149	186	223	261	298	335
74	37	74	112	149	187	224	261	299	336
75	37	75	112	150	187	225	262	300	337
76	37	75	112	150	188	225	263	300	338
77	37	75	113	150	188	226	263	301	339
78	37	75	113	151	189	226	264	302	340
79	37	75	113	151	189	227	265	303	341
80	38	76	114	152	190	228	266	304	342
81	38	76	114	152	190	228	266	304	342
82	38	76	114	152	191	229	267	305	343
83	38	76	114	153	191	229	268	306	344
84	38	76	115	153	192	230	268	307	345
85	38	77	115	154	192	231	269	308	346
86	38	77	115	154	193	231	270	308	347
87	38	77	116	154	193	232	270	309	348
88	38	77	116	155	194	232	271	310	349
89	38	77	116	155	194	233	272	311	350
90	39	78	117	156	195	233	273	312	351
91	39	78	117	156	195	233	273	312	351
92	39	78	117	156	196	234	274	313	352
93	39	78	117	157	196	235	275	314	353
94	39	78	118	157	197	236	275	315	354
95	39	79	118	158	197	237	276	316	355
96	39	79	118	158	198	237	277	316	356
97	39	79	119	158	198	238	277	317	357
98	39	79	119	159	199	238	278	318	358
99	39	79	119	159	199	239	279	319	359
100	40	80	120	160	200	240	280	320	360
101	40	80	120	160	200	240	280	320	360
102	40	80	120	160	201	241	281	321	361

D.	1	2	3	4	5	6	7	8	9
403	40	80	120	161	201	241	282	322	362
404	40	80	121	161	202	242	282	323	363
405	40	81	121	162	202	243	283	324	364
406	40	81	121	162	203	243	284	324	365
407	40	81	122	162	203	244	284	325	366
408	40	81	122	163	204	244	285	326	367
409	40	81	122	163	204	245	286	327	368
410	41	82	123	164	205	246	287	328	369
411	41	82	123	164	205	246	287	328	369
412	41	82	123	164	206	247	288	329	370
413	41	82	123	165	206	247	289	330	371
414	41	82	124	165	207	248	289	331	372
415	41	83	124	166	207	248	290	332	373
416	41	83	124	166	208	249	291	332	374
417	41	83	125	166	208	250	291	333	375
418	41	83	125	167	209	250	292	334	376
419	41	83	125	167	209	251	293	335	377
420	42	84	126	168	210	252	294	336	378
421	42	84	126	168	210	252	294	336	378
422	42	84	126	168	211	253	295	337	379
423	42	84	126	169	211	253	296	338	380
424	42	84	127	169	212	254	296	339	381
425	42	85	127	170	212	255	297	340	382
426	42	85	127	170	213	255	298	340	383
427	42	85	128	170	213	256	298	341	384
428	42	85	128	171	214	256	299	342	385
429	42	85	128	171	214	257	300	343	386
430	43	86	129	172	215	258	301	344	387
431	43	86	129	172	215	258	301	344	387
432	43	86	129	172	216	259	302	345	388
433	43	86	129	173	216	259	303	346	389
434	43	86	130	173	217	260	304	347	390
435	43	87	130	174	217	261	304	348	391

FINIS.